IMAGE Indicators for fisheries MAnaGement in Europe Proposal/Contract no.: FP6 – 044227 - FINAL DECEMBER 2009. Deliverable 3 - Socio-Economic Indicators and their Application

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Indicators for fisheries **MA**na**G**ement in **E**urope

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Deliverable 3

Socio-Economic Indicators and their Application

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TABLE OF CONTENTS

List of Acronyms

AER	Annual Economic Report – the yearly report on "Economic performance of selected European fishing fleets"
CFP	Common Fisheries Policy
DCR	Data Collection Regulation
DEFRA	UK Department for Environment, Food and Rural Affairs
DKK	Danish Kroner
EU	European Union
FD	Danish Directorate of Fisheries
FOI	Institute of Food and Resource Economics
IAD	Institutional Analysis and Development
ICES	International Council for the Exploration of the Sea
ITQ	Individual Transferable Quotas
JRC	Joint Research Centre – an European Commission centre
MS	Member State
MSY	Maximum Sustainable Yield
NSRAC	North Sea Regional Advisory Council
PSR	Pressure State Response
RAC	Regional Advisory Council
SGECA	STECF Subgroup on Economic Assessment
SL	Sustainable Livelihood
STECF	Scientific, Technical and Economic Committee for Fisheries
TAC	Total Allowable Catch
VTQ	Vessel Transferable Quotas
WSSD	World Summit on Sustainable Development

1. Introduction

In the IMAGE project the objectives of Work Package 3 are:

1. *to develop an operational framework of socio-economic indicators to support ecosystem-based fisheries management in RAC regions;*
2. *to identify shortcomings in availability of indicator data at the required scale and recommend on measures to provide such data;*
3. *to contribute to the development of an evaluation framework for fisheries management strategies based on indicators;*
4. *to advice on how indicators can be implemented in the North Sea RAC area.*

The project aim is to establish an indicator framework that is considered legitimate by the RAC stakeholders.

The IMAGE Deliverable 3 takes off (chapter 2) by providing an overall understanding of the "fisheries system" from a social science point of view, identifying the social, economic and institutional drivers behind the human behaviours impacting the ecosystem. A detailed "fisheries system" framework - the modified Institutional Analysis and Development, IAD, framework, (Rudd 2002 and 2004) - is presented, which specifies the critical economic, human, social and institutional factors that are at play in determining fishing pressure. By "critical factors" is here understood factors that can be impacted by management responses of various types, e.g. changes in management regime, incentives, technical regulations, systems of monitoring and control etc. The IAD framework makes an attempt to integrate the various drivers of human behaviour. However, it must be admitted that at this point in time the development of a fully integrated approach, establishing an unequivocal relationship between socio-economic drivers and dependent fishing pressures on marine resources, is not possible.

Chapter 3 presents and discusses the objectives of the EU CFP, with particular focus on the socio-economic objective 3. As a part of this the availability of economic data according to the EU Data Collection Regulation are discussed.

Chapter 4 presents indicators that have been suggested by a group of EU fisheries economists (STECF) to assess to what extent the economic efficiency of fishing fleets have been accomplished at the EU, RAC and national levels respectively. Results of the 2005 study is presented

Chapter 5 addresses indicators of the fulfilment of CFP socio-economic objectives and in particular indicators of the state and directions of the well-being of fishing communities. The chapter includes a presentation of a socio-economic dataframe that has been developed by the North Sea Women's Network in 2007 with the aim to *"construct, test and refine a framework for the collection and management of socio-economic fisheries data and make recommendations on how it can be operationalised"*. The socio-economic dataframe here presented, has been adopted by the North Sea RAC Socio Economic Development Group.

Chapter 6 contains a profiling of the community of Thorsminde, based on the data frame approach. This chapter also addresses the availability and quality of data on the selected socio-economic indicators in Denmark and a comparison of availability in UK in a discussion of how useful the approach will be in a general European context.

Chapter 7 presents a way forward for socio-economic indicator development.

2. The "fisheries system" – in a social science perspective

2.1 System structure

Successful implementation of ecosystem-based fisheries management policies requires that managers consider conservation, economic and social objectives in transdisciplinary policy experiments. There is thus a need for an analytical framework that can be used to both identify and design policy experiments that will guide adaptive ecosystem-based fisheries management and monitor the status of fisheries sustainability.

A number of frameworks have been proposed as sustainable development reference systems. The Sustainable Livelihood (SL) framework has been used widely for agricultural development and forestry systems, and the Pressure State Response (PSR) framework is popular for fisheries applications. The Institutional Analysis and Development (IAD) framework presented below encompasses both the structurally-oriented SL framework and the process-oriented PSR framework and has a number of features that make it suited for complex marine fisheries. The IAD has a strong empirical orientation, necessary for experimental ecosystem-based fisheries management, and offers several potential advantages compared to the PSR and SL frameworks as a platform for monitoring the sustainability of complex fishery systems[1].

When conducting an institutional analysis, the analyst first identifies the **'action arena'** or the focus of analysis that is of primary interest. In ecological-economic analyses, a geographically explicit action arena accounts for the behavioural linkage between contextual variables and rules-in-use, on the one hand, and ecological, social and economic outcomes on the other.

Actors can be viewed as goal-oriented but fallible learners, who have limited resources and cognitive capacity, and function in uncertain environments (Ostrom 1999). **Institutions** are crafted by humans to increase predictability and provide order in uncertain environments, hence facilitating the production of public and quasi-public ecosystem goods and services.

Institutions are comprised of formal rules (e.g., property rights, laws) and/or informal prescriptions (e.g., norms, taboos) that permit, prohibit or require certain actions or outcomes while specifying the sanctions for breaking rules (Crawford and Ostrom 1995). The action arena is the primary focus of institutional analyses that seek to predict outcomes of policy experiments on the basis of implicit or explicit models of human behaviour.

The contextual variables that frame and constrain the action arena need to be specified. These include variables relating to the physical and material world within which the actors interact, the attributes of community, and the formal rules and informal norms that define the 'rules-in-use'. Given a set of exogenous constraints, actors within the action arena consider the costs and benefits of various behaviours, and act according to their personal preferences and perceived incentives. Their aggregate patterns of interaction (e.g., fishing effort) lead to outcomes (e.g., rent capture, stock depletion) that can be evaluated according to socially relevant criteria (e.g., sustainability, adaptability, efficiency, equity). Outcomes dynamically feed back to both the action arena and to higher levels, potentially causing pressures that will ultimately change the rules-in-use or contextual variables, hence feeding back to change of perceived incentives within the action arena.

[1] The modified IAD framework presented here was developed by M. Rudd (Rudd 2002).

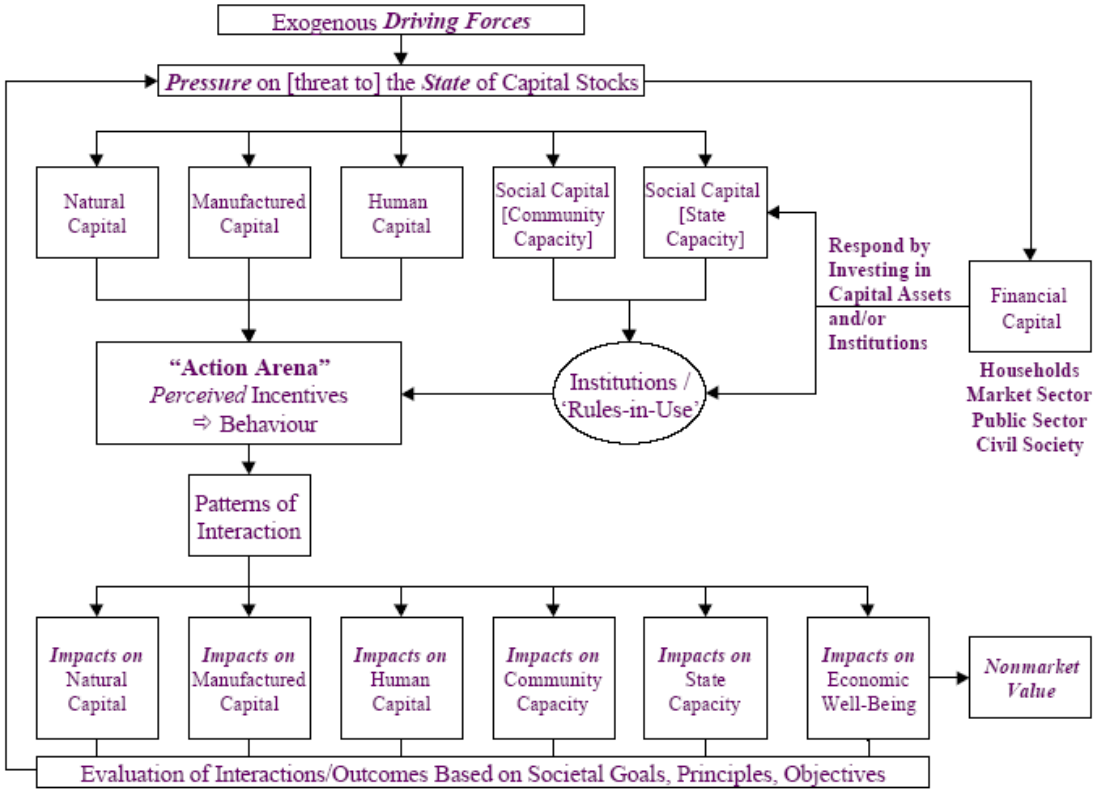


Figure 1.1 Modified Institutional Analysis and Development (IAD) Framework (Rudd 2002)

IAD analyses can also be carried out at the higher levels of decision-making (McGinnis 1999b). At the *collective choice level* analyses focus on how rules regarding resources access and harvesting methods are formulated, rather on the day-to-day operational consequences of those rules. At an even higher *constitutional level*, analyses address questions of whom is eligible to craft collective choice level rules and how their preferences are aggregated (e.g., committee voting rules). Cultural factors (i.e. relatively stable long-run values and beliefs) shape and influence decisions at all levels.

Using the IAD framework, compliance is a pattern of interaction that results from the aggregate effects of individual actors reacting according to incentives that are a function of personal preferences, ecological-economic contextual variables, and the norms and formal rules that comprise institutions. Ecosystem-based fisheries management experiments can alter institutions by changing laws, regulations or policies, or alter the perceived costs and benefits of fishers by changing the level of monitoring effort and/or severity of sanctions.

Incorporating capital stock concepts into the IAD framework is important because investments in capital stocks by various actors (government, private, non-governmental) can be viewed as explicit responses designed to achieve an ecosystem-based fisheries management objective. Financial resources are always scarce (i.e. individuals, corporations and resource managers all face budget constraints) and a variety of investment options may be available to help people improve their well-being. Financial capital might be invested in habitat rehabilitation (natural capital) that increases the sustainable flow of fish from the ecosystem, in skills development programmes for young fishers (human capital), in research that improves fishing technology (physical capital), in meetings that allow fishers to share ideas and build networks (social capital), in enforcement, or in political

processes meant to change existing institutions. The benefit-cost ratio of the different investments may, however, be vastly different. Generally, a policy is worthwhile and should be pursued if the discounted benefits of a particular policy exceed its discounted costs, and priority should be given to projects and programmes that maximize social welfare, thus enhancing overall economic efficiency. One important role for policy experiments is to generate information about the relative returns from different types of investments.

By explicitly accounting for collective level choices about rule selection and constitutional level choices regarding participation in rule-making decisions, the IAD framework systematically expands the types of responses that managers should consider in ecosystem-based fisheries management policy experiments. These responses include investments in social capital at micro- or macro-levels (i.e., community or government capacity) or investments in changing the set of formal rules or the rules regarding the rule-making process itself. The IAD framework is a useful tool for considering an entire spectrum of impacts and outcomes, including the effects of devolution of governance and the creation of increasingly complete property rights (e.g., Yandle 2001).

2.2 System elements

Capital assets

Capital assets are used to transform resources into goods and services that help fulfil human aspirations. All types of capital share two fundamental distinguishing characteristics: each capital investment entails an opportunity cost (savings or consumption foregone) and each permits people to be more productive (Castle 1998).

Natural capital provides a flow of ecosystem goods or services that humans use to improve their well-being. The value of these goods and services derives from direct, indirect and/or non-use functions. The 'strong sustainability' principle proposes that substitutability between natural and human-made capital is limited, implying that relative rates of resource depletion must be less or equal to the natural rate of renewal. This principle is broadly accepted by fisheries managers and is institutionalized under UNCLOS and the FAO Code of Conduct for Responsible Fisheries (Garcia and Staples 2000). In the EU the achievement of MSY for all targeted fish stocks is the overall principle adopted (CFP objective 1).

Physical (manufactured) capital is the stock of produced assets that people can use over time. It includes equipment, facilities, technology and software devices that are designed to increase the effectiveness or efficiency of the process of transforming resources, including fish, into outputs that contribute to human well-being. Physical capital stocks (fishing vessels and gear) depreciate and require investment to be maintained.

Human capital is an asset in that it helps people increase their productivity and efficiency in the transformation of resources into goods and services and is, thus, complementary to physical capital. It is widely recognized that human capital (fishers' professional knowledge) can be developed through investments in the training, education and health of workers (Helliwell 2001).

The broad complex of social networks, norms, rules and protocols constitute social capital (Ostrom 1999; Rudd 2000; Woolcock and Narayan 2000; Helliwell 2001). An increase in social capital reduces the cost of Common Property Resources production by increasing the likelihood of successful coordination and collective action. Social capital, in turn, is a function of social interaction and structure. At the micro-level of individuals and communities, social capital can

serve three functions, as an asset that can be used for either 'bonding', 'bridging' (Woolcock and Narayan 2000) or 'linking' (Woolcock 2001). 'Bonding' results when strong intra-community ties give kin and communities a sense of identity and common purpose. 'Bridging' results when communities endowed with diverse inter-community ties are in a stronger position to confront problems and take advantage of economic opportunities. 'Linking' refers to the capacity of community members to gain sustained access to decision-makers in private and government organizations. Thus, community capacity is a function of internal norms and networks, but there is also an interactive element relating to the broader institutional infrastructure and formal governance organizations. At the macro-level of public sector organizations, state capacity can be defined by criteria that include transparency and accountability, support for well-defined property rights via legislation and legal infrastructure, and the availability of sufficient financial and human resources to fulfil ecosystem-based fisheries management mandates.

Financial capital is special because it is generated by the production process (i.e., resource rent capture) and can be re-invested in any other type of capital. Financial capital generated by fishery resource rents accrue to the owners or users (i.e., property rights holders) of the resource. This could be either government or private interests, depending on the licensing, taxation and property rights regimes. For example, there has been a recent move in Canadian fisheries to management cost recovery by passing on certain costs (e.g., observer monitoring) to industry and increasing license fees (Sinclair et al. 1999; DFO 2002). Rent dissipation – caused by conflicts, overcapitalization, or rent seeking – decreases the potential financial resources available to society, thus imposing costs on society as a whole and reducing future options for maintaining or improving societal well-being. A central concern of ecosystem-based fisheries management is the development of appropriate governance regimes and institutions that constrain short-term opportunism and maintain natural capital that increases long-run total economic value.

Institutions/'Rules-in-Use'

The institutions (rules-in-use) that influence actor incentives and behaviour include both social norms and formal rules (i.e., regulations, laws, and bundles of rights). A norm is "a pattern of behaviour that is customary, expected and self-enforcing. Everyone conforms, everyone expects others to conform, and everyone has good reason to conform because conforming is in each person's best interest when everyone else plans to conform" (Young 1996:105). Formal rules specify actions or outcomes that are permitted, prohibited or required, and prescribe formal sanctions for rule violation (Crawford and Ostrom 1995).

Regulatory approaches are widely used in fisheries and take on a number of different forms generally aimed at controlling fishing effort and/or increasing the age at which fish become vulnerable to fishing. If a threat of detection and punishment is not credible, individual behaviour is unlikely to change significantly even with formal rules in place.

Pure regulatory approaches to achieve fisheries sustainability are today seen as untenable and, as a result, there has been an increasing move to rights-based fisheries, where property rights and market incentives are used in attempts to achieve sustainability (e.g., Yandle 2001).

Property rights are a type of institution, composed of bundles of rules that (1) limit access to a resource and (2) limit the amount, technology, and timing used to withdraw diverse resource units from the system (Ostrom 2000). Operational level rules governing timing, technology, purpose of use, and quantity are devised by those holding higher level collective choice rights of management and exclusion. Schlager and Ostrom (1992) developed a matrix of property rights and categories of rights holders. 'Claimants' hold rights of resource access and withdrawal, and additional collective

choice rights to participate in the management process, including making decisions concerning resource harvest limits and production technologies. At the next higher level of property rights, 'proprietors' hold additional rights to determine who may access and harvest fish. At the highest level, 'owners' – who may be individuals, corporations, communal groups, or government – have property rights that permit the transfer or sale of their rights subject to specific conditions.

Action Arena

Policy experiments link policy options to hypothesized outcomes by using explicit or implicit models of human choice within the action arena. The action arena is described by two sets of variables, one related to the characteristics and capabilities of relevant actors, and the other related to the structures that shape the incentives that actors perceive for various behaviours.

Actors can be characterized by four sets of variables in an institutional analysis (Ostrom 1990; Ostrom et al. 1994): the resources they bring to a situation; the way that they internally value alternate actions and outcomes; the knowledge and information that they acquire and possess; and the mechanisms by which actors select particular actions. In general, actors can be thought of as goal-oriented but fallible learners who respond to economic incentives. Which actors are considered relevant in policy experiments and monitoring is situation-specific. Those people or groups that directly use the resource for consumptive or non-consumptive purposes, governance organizations that manage the resource and actors that monitor compliance should be considered.

The action situation considers the set of actors, their positions, the set of allowable actions and potential outcomes of these actions, the level of control that actors have over their choices, the information available, and the costs and benefits of alternative actions and outcomes.

Pattern of Interaction and Impacts

Actors make choices based on their own preferences (or mandates, in the case of government agencies), the costs and benefits that they assign to alternative actions and outcomes, and strategic considerations (i.e., expectations of the behaviour of others). These individual choices lead to the patterns of interaction relevant for ecosystem-based fisheries management. Under the IAD framework, behavioural patterns of interaction are distinguished from impacts or outcomes. Patterns of interaction result directly from actor behaviour and, in an operational level analysis, three main patterns will be of interest: fishing effort, fishing location, and rule compliance. These patterns, in turn, lead to impacts such as total landings, bycatch, net income and other more complex derived outcomes (e.g., technical efficiency).

Compliance with formal rules and regulations deserves special attention in ecosystem-based fisheries management. If there are strong incentives for fishers to cheat, then the likelihood of achieving fisheries sustainability can be severely compromised. The degree and type of monitoring, in combination with the types of penalties for contravening rules, influence the likelihood of cheating. That is, the expected cost of rule violation is a function of both the likelihood of being detected and sanctioned, and the severity of the sanction. Compliance is far from perfect because fishers know full well that the expected costs of being (1) caught, (2) convicted and (3) strongly sanctioned are often less than the economic benefits derived from illegal behaviour.

Impacts need to be defined in terms of relevant evaluative criteria. There are a vast array of possible objectives and indicators of fisheries outcomes and sustainability (Garcia and Staples 2000; Sutinen 2000; Jamieson et al. 2001). Impacts themselves do not necessarily pose threats to capital stocks; only when the use of ecological goods or services exceeds their rates of renewal does the impact

become a pressure. It is also important to understand that not all pressures on capital stocks are endogenous but that exogenous variables (driving forces) also exert pressure on capital stocks (e.g., demographic, environmental or technological change).

Macroeconomic market forces are particularly important for analyzing operational level ecosystem-based fisheries management situations because of the speed at which market prices, interest rates and other key variables change, and due to the importance of market price and input cost variables in influencing day-to-day fishing decisions at the operational level.

Evaluative Criteria

The choice of evaluative criteria reflects the vision and objectives of actors within the fishery as well as broader societal interests; ecosystem-based fisheries management should therefore be broadly participatory in nature (Costanza et al. 1998; Garcia and Staples 2000).

Three broad categories – conservation, economic and social performance – are salient for classification of ecosystem-based fisheries management impacts. In general, conservation criteria consider whether ecological impacts are sufficient to cause deterioration of the stock of natural capital and its ability to provide flows of key goods (e.g., fish) or services (e.g. insurance against declines in resilience). Economic criteria broadly relate to resource rent capture and economic efficiency, accounting for both wealth generation and the transaction costs of management (i.e., reaching agreements, monitoring, enforcement and the costs of ex post opportunism). Social criteria generally focus on equity, either in terms of ensuring that benefits accrue to those that have limited financial means or that those who bear the costs of conservation are the people that benefit most from increases in natural capital. Other public policy analyses have used evaluative criteria of institutional adaptability, conformance with general social norms and values, and bureaucratic accountability or transparency (e.g., Ostrom et al. 1993).

Adaptability is an evaluative criterion that deserves special attention in ecosystem-based fisheries management. When considering institutional adaptability, Sproule-Jones (1999) notes that different actors with different bundles of resource access rights incur different transaction costs. The lower the transaction costs, the more adaptable actors will be and, thus, more willing and able to experiment and innovate in ecosystem-based fisheries management policy experiments.

Wilson (2002) argues that matching ecological and institutional scale in complex adaptive fisheries systems is the central element needed to ensure adaptability for ecosystem-based fisheries management. Management should focus on maintaining long-run system stability while the production of ecological goods and services cycle within normal bounds, thus allowing resource users to recognize resource abundance patterns and maintain sufficient flexibility to adjust to those cycles. Hierarchical but overlapping governance organizations (‘polycentric systems’) are known to be effective for producing a number of types of public and quasi-public goods and services (McGinnis 1999a, 1999b).

Investment Responses

When capital assets, and hence the productive capacity of humans to fulfil aspirations, are threatened, society can respond in a number of ways. All responses, however, can fundamentally be viewed as investment decisions by market, collective choice or public organizations. Achieving societal objectives implies that certain levels or combinations of capital need to be developed and/or maintained. This, in turn, may require investment or disinvestment in the various types of capital.

Investments by the market and public sectors in manufactured capital fall within the realm of traditional economic theory. Likewise, investments in human capital are now widely recognized to lead to increases in productivity and are important for market and public sector organizations alike (Barro 2001). Direct investments in natural capital are possible, although often problematic due to our limited understanding of ecosystem dynamics.

Using the IAD framework, it is in fact possible to categorize many societal responses to various pressures into one or more of five broad categories of social capital investment. These include direct investments in community capacity (by increasing structural and/or cognitive social capital) or public sector governance capacity. In addition, investments can be made in institutions at the operational, collective choice and constitutional levels by (1) increasing the level of monitoring and/or enforcement of existing rules, (2) changing the formal rules governing the fishery, or (3) changing the rule-making process itself. Investments in better monitoring and enforcement can be made at relatively low cost although enforcement costs can escalate rapidly and become prohibitively expensive if local norms are not congruent with formal rules (Ostrom 1990). Thus, investments in rule monitoring and enforcement are important for successful resource management, but are not likely sufficient for long-run sustainability. In a multi-species fishery the likelihood of detection of discarding is relatively low. Increasing the sophistication of monitoring through statistical comparisons of landings with shore-based sampling is one method that may alter fishers' economic incentives and induce increased compliance with discarding regulations.

Another response is to change the formal rules governing behaviours or outcomes that are required, prohibited or permitted by law. Because changing rules is a higher-level process, possibly involving protracted negotiations amongst those with collective action level rights, societal investments aimed at changing the formal rules-in-use will be more expensive than simply increasing monitoring and enforcement (in the short-term – there is an opportunity cost for long-term returns). Similarly, returns from investments in norm-seeding activities by government, NGOs or other 'norm entrepreneurs' may be effective under certain circumstances (Sunstein 1996).

Some institutions can lead to outcomes that do not meet broad societal goals and objectives but that do provide economic benefits to powerful vested interests. When there is ongoing tension between certain decision makers or interest groups and society as a whole, there is likely to be increasing calls for political changes about how those involved in the rule setting process are chosen and how preferences are articulated. Hence, operational level rules, such as property rights, can be indirectly subject to wider societal processes of adaptation in which stakeholders articulate and aggregate their preferences (Sproule-Jones, 1999). Rules about the articulation of stakeholder interests are those that refer to selecting and representing stakeholders for the governance process. Aggregation rules deal with the transformation of diverse stakeholder interests into actions that yield outcomes and often specify the timing or frequency of meetings and technical rules about voting needed to resolve conflicts. Constitutional level change is more expensive again relative to lower level changes that change rules or simply devote more resources to enforcement.

2.3 Use of the modified (Rudd) IAD framework

The IAD framework intends to explain how the interrelation between different forms of capital (natural, manufactured, human and social capital and institutions) influences the behaviour of the fisher. The aggregated behaviours, e.g. the fishery, impact and set pressure on the different types of capital, which then again influence the behaviour in the next round.

Bio-economic models traditionally deal with the interrelation between natural capital (fish stocks) and manufactured capital (fishing fleets, vessels), but rarely include other forms of capital.[2]

The IAD framework highlights that in order to understand the actual behaviour you have to include also the influence of human capital, and social capital, which is expressed in institutions or "rules-in-use". In an ideal, fully integrated ecosystem-based fisheries management the various interrelations between the different types of capital, and between elements within the type of capital, would be described in order to understand how changes in the capital stock (of various types) would impact on the behaviour of the fisher and thereby also the fishing pressure. This would be a very ambitious project – and maybe even principally impossible.

As an alternative the fully integrated model framework and understanding may be used to search for partial frameworks and methods beyond traditional bio-economics which can shed light on elements influencing the behaviour of the fisher and the aggregated fishing pressure on the ecosystem. Among such partial frameworks are models and methods for the studying of fishers and fleet behaviour.

2.3.1 Research on fisher and fleet behaviour

The study of fishermen's behaviour is not a new discipline in fisheries sciences, however. Most of these are descriptive work studies of the spatial and temporal effort allocation of selected fisheries whereas only a few studies have attempted to develop predictive models for fleet dynamics and fishermen responses to changes in external factors. Analysing fishermen's behaviour can be structured in two levels in terms of time response scale: Long and short-term behaviour response. Long-term behaviour (strategies) is year to year changes in the dynamics of the capacity of the fleet (fleet efficiency or number of vessels entering or leaving the fishery due to decommission, investment or attrition). Short-term behaviour (tactics) is mainly made on the basis of a trip and is generated by the decisions that fishermen make about when and where to fish (in terms of choice of fishing location, target species or type of gear/rigging) and which fish to land or discard. Two studies recently undertaken by IMAGE partner institutions have attempted to address the long- and short-term behaviour respectively. These studies are:

A. Analysing the interactions between a multispecies resource base and a multifleet-multigear fishery and the pressure exerted by the fleets on the fish community

Only a few frameworks and models applying units relevant both to the ecological and economic dynamics of the fishery system for analysing the behaviour of fishers/fishing vessels/fishing fleets have been developed and tested in recent years. A project undertaken by IFREMER with funding support from the IMAGE project has investigated the fishing fleet typology, economic dependence, and species landing profiles of the French fleets in the Bay of Biscay, 2000-2006[3] with the aim of matching, at the annual scale, fishery units defined by technological criteria (e. g. type of vessel and fishing gear), with their pressure on the ecosystem described by their catch composition.

[2] More detailed descriptions of the strengths and weaknesses of existing bio-economic models can be found in: Prellezo, R., Accadia, P., Andersen J. L, Little, A., Nielsen R., Andersen, B.S., Röckmann C., Powell J. and Buisman, E. (2009) Survey of existing bio-economic models: Final report. AZTI-Tecnalia. 283 pp. Available at: http://ec.europa.eu/fisheries/publications/studies/bioeconomic_models_en.pdf.

[3] Fabienne Daurès, Marie-Joëlle Rochet, Sylvie Van Iseghem and Verena M. Trenkel: *Fishing fleet typology, economic dependence, and species landing profiles of the French fleets in the Bay of Biscay, 2000-2006.* Aquat. Living Resour. 22(2009).

Firstly, fishing fleets, or groups of vessels having similar behaviour and fishing strategies, were defined on the basis of input criteria such as type of gear used and distance from the coast, the latter considered as a proxy for vessel size. Secondly, economic dependence of these fleets on the major target species and their contribution to these species' production were analyzed. Thirdly, the degree to which different fleets exert a similar pressure on the fish community, and whether this pressure is consistent over time, was examined by a multivariate analysis of their catch profiles. Finally, the dynamics of these fleets, in terms of the frequency of year-to-year movements of vessels between fleets, was analysed.

Homogenous fishing fleets were defined based on fishing gears used and fishing distance from the coast. There are 18 fishing gear classes, seven of which contain several gears, e.g. the class of mixed bottom and pelagic trawls. The mixed gear classes correspond to vessels that change gear, either within or between fishing trips. Three fishing distance classes were identified: (a) coastal vessels, fishing within 12 nm from the coast during at least 75% of their fishing time, (b) offshore vessels spending at least 75% of their fishing time between 12 nm and the shelf break, and (c) shelf vessels, and it groups all other vessels, i.e. those fishing both in the coastal and offshore areas at different times of the year. Overall 31 fleets were defined in this way as not all possible combinations actually occur in the Bay of Biscay.

These fleets landed many species during the period 2000-2006, and the fishing pressure deployed (expressed by the landings) varied widely. However, 10 of the fleets contributed 70% of the landings in weight and value. These ten fleets represented 34% of vessels, 51% of total fishing power (kW), indicating a strong concentration of means of production in the Bay of Biscay. Furthermore, the analysis revealed widely varying dependency on the nine major species, with in many cases a high degree of dependence on one or two species only. Overall, four groups of fleets were distinguished with respect to their contribution to landings and economic dependence on the nine most important species in the Bay of Biscay:

i) Nine fleets with high contribution and dependence: Nephrops trawlers, coastal seiners and shelf and offshore sole and other netters
ii) Two fleets with high contributions but low dependence: mixed trawlers and other gear users and sole netters in coastal areas
iii) Seven fleets with low contributions but high dependence spanning a range of gears and all distance classes
iv) Twelve fleets with low contributions and low dependence, using mainly pots and nets or a mixture of gears primarily in the coastal zone.

The analysis of landings yielded 12 distinct profiles and grouped fleets using similar gears to target the same species, independent of the fishing area. Thus the type of impact of a fleet on the fish community seems to be primarily determined by the gear it is using. This is not surprising, considering the obvious link between the gear (and fishing practice) and the targeted species. Most of them have distinct behaviours, thus specific fishing gear is required to catch them.

Most fleets kept the same landings composition profile during the study period. Different fleets might target the same species when available, but they may display distinct responses when: (i) target species become less available (as seen for anchovy); (ii) prices decrease; (iii) costs for fishing increase, e.g. due to increased fuel prices; (iv) or specific management measures are implemented.
The response options are then not only changing target species, but also changing or adding other gear types or changing fishing distance (i.e. the operation range). The latter option may not be available to small vessels which cannot move offshore. Thus by considering fleets as groups of

fishing units which have a similar type of fishing impact and behaviour (particularly in case of change) it may be possible to understand fleets responses to economic, environmental and governance change. However, it is also demonstrated that, in a given fleet, responses may differ between vessels. Thus, future studies on vessel behaviour are required to understand the differences between vessels of the same fleet when reacting to change.

During the study period, spawning stock biomass (SSB) of Nephrops and hake showed an increasing trend while sole SSB decreased until 2003 and stabilised thereafter. Sardine and sea bass were not formally assessed, but survey data indicate that sea bass population size in the Bay of Biscay increased (unpublished data) and sardine population size varied widely with no trend, though total landings increased. The decreasing availability of sole had detectable consequences. Vessels moved from the offshore sole netter fleet to the shelf sole netters, and from those to the coastal sole netter fleet, resulting in change in economic dependence. For Nephrops, an increase in the variability of the fishing distance of Nephrops trawlers was observed with a move from both the offshore and the coastal fleet to the shelf fleet. Nonetheless, dependence on Nephrops remained stable for all three fleets. Increasing hake abundance might be responsible for the observed increasing dependence, from 50 to over 70%, of the offshore netters on this species. Increasing sea bass abundance and the absence of any catch or effort regulation were probably responsible for attracting vessels from outside into the coastal Bay of Biscay fleets using hooks. Offshore pelagic trawlers switched from anchovy to albacore and to a lesser degree to sea bass and mackerel when the anchovy fishery was closed in 2005.

Project outcome

The IFREMER project attempted to deal with one of the challenges of the ecosystem approach to fisheries (EAF): predicting change and adapting to it at low cost. It focused on the components of the fishery sector in the Bay of Biscay with the hope that they would be operational enough to meaningfully describe the interactions between the multispecies resource base and the multifleet-multigear fishery and the pressure exerted by the fleets on the fish community. The project has shown that while keeping main patterns unchanged for years, fleets were nonetheless adapting to change through migration of some of their units between gears, species, and fishing areas. This shows that there is plasticity in the fleet composition and functioning and hence a degree of resilience. Moreover, it is shown that strong dependency on species (reflecting specialization) may not be synonymous with "vulnerability". This may add to the resilience of the resource base itself (e.g. as it adapts to climate change) and hence to the total resilience of the system. However, the observations also show that the opportunities for change (e.g. in the fishing range, fishing technology and target species) may be observed and perhaps roughly foreseen, but cannot yet be accurately predicted. More detailed studies, at vessel level, might be able to improve the understanding of change at that scale and perhaps the capacity to predict it.

B. Modelling short-term choice behaviour of Danish fishermen

This project, which focuses on the short-term choice behaviour in terms of the spatial and temporal allocation of effort of Danish fishermen in a mixed fishery, was conducted by IMAGE partners DIFRES and IFM as part of the development of the TEMAS bio-economic model (fleet-based bio-economic simulation software for management strategies accounting for fishers' behaviour)[4].

[4] Bo Sølgaard Andersen and Anne-Sofie Christensen, *Modelling short-term choice behaviour of Danish fishermen in a mixed fishery*, 2005 NAAFE Forum Proceedings (pp. 13-26)

The main objective of this study was to construct an analytical tool to describe, analyse and model how Danish North Sea gillnetters allocate their effort among a defined number of fisheries. Firstly, the information from fishermen is applied to identify important factors influencing the short-term decision-making process. Secondly, the obtained knowledge forms the theoretical background of modelling the behaviour, based on quantitative information from commercial fishery (logbooks, sale slips and vessel register data). The model is used to predict the reallocation of fishing effort for the Danish North Sea gillnet fleet before, under and after an area closure.

The Danish fishery for human consumption in the North Sea is characterized by exploitation of a wide range of fish stocks (such as cod, haddock, saithe, hake, plaice, sole, turbot and Nephrops) with several different types of gears and riggings. One of the larger fleet components in this mixed fishery is the Danish North Sea gillnet fleet, which during the last decades has landed over 50% of the Danish cod quota yearly and contributed to around 30% of the total annual Danish landing of demersal species in the North Sea ((in terms of value)). The majority of the vessels in this fleet have their fishing activity in the North Sea, and during the season they shift between different types of fisheries.

To identify important factors influencing the short-term decision-making process qualitative in-depth interviews were conducted with sixteen key informant fishermen, of which 5 were gillnetters in the relevant area. In the second step a questionnaire based on the interviews was distributed to demersal fishermen. Of these 44 gillnetters with home harbours in the North Sea responded. In this study the interest was mainly on the part of the questionnaire about the importance of different factors determining the short-term behaviour. From the interview seven factors were identified: (1) the present situation (own experience from recent trips and fish prices); (2) the season/time of the year; (3) weather (wind and currents); (4) regulations; (5) limitation of by-catch; (6) fuel cost or distance; and (7) information from other fishermen. These factors were incorporated into the questionnaire to analyse their importance in the choice of fishing ground and target species.

Data for the quantitative analysis of fishermen's behaviour were derived from the Danish national fishery database, which is based on logbooks, sale slips and vessel register data. The database contains information per vessel at trip level, including landing weights and values per species, gear, mesh size, fishing location at a resolution of ICES rectangles, and vessel characteristics such as length and tonnages. The dataset used contained 40492 fishing trips, undertaken by 117 vessels.

In the case of complex fisheries, where the fisherman has the opportunity of exploiting different species in several fishing grounds (such as the mixed fishery in the North Sea), the analysis of a fisherman's fishing activity (on the basis of a trip) has been undertaken through defining types of fishing activities based on main characteristics, such as gear used, riggings, fishing grounds and target species. Five Danish gillnet fisheries in the North Sea were identified (cod, plaice, sole, turbot and ‘other' fishery), based on choice of gear and target species. Based on knowledge from historical catch information 5 areas were defined. The defined areas were designed to fit the closure of a large fishing area in the North Sea in 2001. This gave a total of 25 choices (5 target species and 5 areas). However, choices with <100 trips for the entire study period were grouped with nearby fishing areas. The final number combination of fishing area and target species was 16.

Conceptual framework of empirical model

A random utility methodology was applied. The basic assumption in the random utility approach relies on the decision makers (fishermen) being assumed to choose the alternative that maximizes his utility. The observed utility is based on the identified decision factors from the interviews.

However, the qualitative information is not found directly in the fishery database, and proxies were defined for those variables.

A Danish gillnetter often makes several trips during a month where he gathers different levels of experience/knowledge from where he has been fishing. The value of the information a fisherman collects from past knowledge/experience (in terms of catch success) tends to rapidly decline, due to the high temporal and spatial variability of the fish stocks. By assuming the level of recent catch success in a given choice to be proportional with recent effort allocated to that choice, the percentage of effort a fisherman has made in each choice during the last month was used as a proxy for attractiveness of fishing in the same choice as in the previous month

The interviews also indicated that Danish gillnetters tend to follow the same fishing patterns as last year, due to the seasonal availability of the individual fish stocks. As a proxy for attractiveness of the same choice as last year, we used the percentage of the effort that the fisherman made in each choice in the same month last year.

Recent information of other fishermen's catch success has been a central way to gain information of the expected profit (or revenue). To estimate a fisherman's expected revenue, various types of expectation models have been applied, ranging from simple approaches such as use of total value or average value for the fleet to the more sophisticated production functions model, where different types of vessel characteristics are taken into account. Similar as for own experiences, the value of catch information from other fishermen is relatively short-lived and very quickly becomes unattractive.

In the study it is assumed that a fisherman makes use of previous period catch information in terms of value per unit of effort (VPUE) and information exchange of the average revenue rate on a monthly scale among the vessel within the gillnet fleet. The average VPUE based catch information from the previous month is standardised in terms of individual differences in catchability (or fishing power) among the vessels before it is applied as an explanatory variable in the quantitative behaviour model.

After introduction of electronic equipment it has become easy for fishermen to follow and locate other colleagues' fishing patterns and spatial aggregation of vessels. In the present study the total effort from the previous month was used as a proxy for vessel aggregation.

In the interviews the fuel cost was frequently mentioned to influence the short-term decision-making. No information of fuel consumption was available on trip level; instead distances were applied as a proxy for fuel cost. Distance was calculated as the distance from departure harbour to the fishing ground (centre of the ICES rectangle).

The data set was specifically selected for a time period where only moderate changes in the management regulation were enforced. Therefore management regulation was not explicitly included in the utility function. But fishermen may have been under influences of the current management regulations, such as mesh size regulation and by-catch limitation. However, these effects were implicitly included in the calculation of the expected revenue rate. So far, no applicable proxies for weather and bycatch have been defined (primarily due to lack of information) and are therefore not included in the current version.

Behaviour model

The identified parameters in the utility function were estimated with different classes of logit models. When the variables in the utility function are estimated they can be used to predict the relative probability of the individual fisherman's choice among the available alternatives.

The simplest way to structure a fisherman's short-term decision processes is by assuming a single level decision structure (or tree). In the first test hypothesis a single level decision-making structure was applied by assuming that a fisherman, before he goes fishing, chooses among the 16 choices which are defined as a combination of target species and fishing ground.

For the North Sea gillnetters the choices of target species were observed to be strongly seasonal where a fisherman first chooses a target species and afterwards a fishing area. The utility in the first level is the percentage of effort that a given fisherman had made in each fattractiveness of a fisherman choosing the same target species as last year at the same time of the season.

Both quantitative behaviour models (the standard conditional and nested logit model) operate at the level of the individual fisherman. However, the study also examined how well the applied behaviour models predict allocation of effort among the entire North Sea gillnet fleet and how these models predict management changes such as temporal closure of a fishing area. In the present study two ways were selected to evaluate the predicted power of the applied behaviour models. First, by comparing the observed aggregated effort with the predicted aggregated effort, where the predicted effort was calculated by multiplying the average probability for each choice by the total observed effort for all choices for each month.

Secondly, the estimated parameters were used to evaluate how the behaviour models predicted the closure of a larger area in the North Sea in 2001 (from 15 February to 31 April) due to protection of the spawning cod stock. A part of the closure was placed in an area where the Danish North Sea gillnet fleet in that period normally had their main fishing activity. The estimated coefficients from the behaviour models were applied to predict/forecast the spatial allocation of effort (at a monthly timescale) for the North Sea gillnet fleet before, under and after the closure.

Results

The findings from the questionnaires indicated clearly that the present situation, season, weather and regulation were of major importance for the Danish North Sea gillnet fleet, whereas information from other fishermen, distance and fuel cost were less important. The findings were used to define the explanatory variables expressed in the utility function of the applied quantitative behaviour models.

For the most abundant target species in terms of total effort, both behaviour models captured the seasonality very well. For plaice and sole both models had a tendency to respond to the observed seasonal peaks with a lag period of 1-2 months. The lagged response was expected due to high attractiveness for a fisherman to make the same choice as previous months and/or year. For the less frequent choices, in terms of effort, none of the behaviour models were able to capture the seasonal dynamic; however, these choices represented only a minor part of the total effort allocated.

Before the area closure both models seem to fit the allocation of the observed effort very well. In the first month of the closure period both models predicted an increase in effort for cod in area 1. However, the observed effort shows that most of the vessels instead shifted to targeting plaice in area 1 and 3. In the second month of the closure (April) both behaviour models recaptured the

changes in the allocation of effort. It should be mentioned that the increased effort in the sole fishery in area 1 and 2 was also observed in the previous years and both models captured this increased effort a month later.

The transformation of the information from the questionnaire survey into a useful format for the quantitative behaviour analysis was not a straightforward process as the identified variables were not directly accessible from the fishermen's logbooks and sale slips information. Unfortunately, the questionnaires were anonymous, and the linking to the individual fishermen in the fishery data base was therefore not possible. This anonymity was necessary to attain successfully high feedback and reliability of the answers from the questionnaires. In general, the problems of defining explanatory variables (or data information) that go into the utility function in discrete choice models has been given relatively little attention. This study has made one step towards how to utilize information from questionnaire surveys in a more quantitative approach (based on logbook information) to analyse fishermen's behaviour. But it has also shown the need for more interdisciplinary work to improve the fundamental understanding of which and how decision factors influence fishermen's short decision-making process.

The questionnaire survey was not only designed to identify important decision factors but also to verify the findings of the quantitative behaviour analysis. Except for distance, high similarities were found for all identified decision factors when comparing trends in the level of importance of the decision factors between the questionnaire survey and the quantitative behaviour analysis. Overall this indicated consistency in the definition of applied proxies.

Own experience/knowledge was weighted as the most important decision factor whereas the expected revenue rate (or information from other fishermen) was ranked as being of minor importance. Therefore the "own experience" proxy was modified from a simple dummy variable to including the level of recent experiences which the individual fishermen gathered during the previous month of fishing. This has contributed to a more flexible and dynamic description and interpretation of this decision factor. However, the applied definition may only be applicable for vessels with trips of few days, whereas for vessels in multi-day-trip fisheries, the updating process of own experience and experience from other fishermen has been found to be of major importance. Still the "own experiences" variable does not capture all processes involved in the decision when a fisherman tends to make the same choice as in previous trips (or periods).

Information from other fishermen in terms of catch rates or quantity has frequently been applied to calculate proxies for expected revenue, where positive responses have been used to confirm economic rational behaviour. In the study it was found that gillnetters were positive to alternatives with higher expected revenue rates, and that may imply a profit maximizing behaviour among the Danish gillnetters. However, this statement was blurred by the relatively low explanatory power of estimated coefficient compared to the estimated coefficients of own experiences. The weak response fitted the findings in the questionnaires (information from other fishermen were on average ranked relatively low). The findings from the interviews confirmed the complex nature of fishermen's short-term decision-making process of when and where to fish. This complex matter may blur the theories of economic rational behaviour, but on the other hand it also indicated that more socially related factors may influence on a fisherman's short-term decision process.

The observed variability among the respondents in the questionnaires indicated some degree of heterogeneity among Danish gillnetters. This heterogeneous responsiveness may be due to differences in choice of strategy, fixed and variable costs, opportunity costs, knowledge and risk attitudes. The applied behaviour model was designed to predict the spatial effort distribution in a mixed fishery under the closure of a larger area in the North Sea. Overall, the model succeeded in

predicting the redistribution of effort among the defined fishing areas and target species under and after the closure. But the findings illustrated that the level of prediction also depended on both the temporal and spatial accuracy of interest. Modelling spatial choice behaviour in terms of effort allocation, based on catch and effort information from fishermen logbooks (such as in this study and many other studies of European fisheries), is restricted to the spatial resolution of the size of the predefined ICES statistical rectangles. As short-term closures (e.g., seasonal closure, protection of aggregations of juvenile and spawning fish) are getting more frequently used as a management instrument, more spatial catch and effort information on individual fishermen is needed (such as satellite data combined with catch data).

3. The Common Fisheries Policy objectives and indicators of policy performance

At the first IMAGE project meeting (22-23 January 2007) it was agreed that the operational (management) objectives of the CFP would be identified and agreed in consultation with the European Commission. In consultation with the Commission (letter from Directorate-General for Fisheries and Maritime Affairs 22-02-2007), the following level 1 (pan-European) objective and level 2 (RAC-scale) objectives were agreed:

3.1 Level 1 (Pan-European) objective

"The precautionary approach shall be applied in taking measures designed to protect and conserve living aquatic resources, to provide for their sustainable exploitation and to minimise the impact of fishing activities on marine ecosystems. It shall aim at a progressive implementation of an ecosystem-based approach to fisheries management. It shall aim to contribute to efficient fishing activities within an economically viable and competitive fisheries and aquaculture industry, providing a fair standard of living for those who depend on fishing activities and taking into account the interests of consumers"[5].

3.2 Level 2 (RAC-level) objectives

1. "To maintain fishing mortality at or below levels that is necessary to achieve maximum sustainable yield[1] for all targeted stocks"[6]

2. "To maintain or reduce fishing impact on the ecosystem at or below sustainable levels"[7]

3. "To develop a viable, economically efficient and globally competitive European fisheries and aquaculture industry"

The socio-economic objective (3) *"To develop a viable, economically efficient and globally competitive European fisheries and aquaculture industry"* requires a concise interpretation of the wording and concepts used in order to identify relevant indicators.

The concept of ***viability*** has economic, social as well as cultural dimensions. The European Union (EU) has made a legislative commitment in the Common Fisheries Policy to: "…provide for sustainable exploitation of living aquatic resources and of aquaculture in the context of sustainable development, taking account of the environmental, economic and social aspects in a balanced manner" (Council of the European Union 2002). However, until now only implications of

[5] Based on Article 2 of the Council Regulation Nr 2371/2002 (Council of the European Union 2002).

[6] This is taken to be MSY as referred to in paragraph 31a the Johannesburg declaration from the WSSD 'Maintain or restore stocks to levels that can produce the maximum sustainable yield with the aim of achieving these goals for depleted stocks on an urgent basis and where possible not later than 2015'. It could be interpreted in terms of fishing mortality or biomass. It is further assumed that single species maximum sustainable yield might not be achievable for all targeted populations together and thus this wording refers to maximum sustainable yield in a multispecies context.

[7] This is taken to include impacts on all components and attributes in the marine ecosystem, with a likely emphasis on commitments to the conservation of biodiversity consistent with, for example, paragraph 32a of the Johannesburg Declaration 'Maintain the productivity and biodiversity of important and vulnerable marine and coastal areas, including in areas within and beyond national jurisdiction'.

management initiatives on fish stock development and fleet economy are considered in any detail in the fisheries decision-making process. The type of data that has been collected for the Commission as per the Regulation on Data Collection (Council of the European Union 2000 and 2001) and as of 2008 the Multiannual Community Programme (Council of the European Union 2008), updating the DCR, are indicative of what dimensions are meant to be included in the term “viable” in the CFP objective 3.

Welcoming the adoption by the Council of the 2008 Multiannual Community Programme for fisheries data collection, Joe Borg, Commissioner for Fisheries and Maritime Affairs, said: "…. the new system will allow for a move to fisheries management that takes account of ecological, economic and social data…”. However, there are very few additional data collected in the new programme, and thereby few new indicator sets compared to the previous extended programme. It is although an important development that all Members States are obliged to collect data on all (extended programme) indicators[8], whereas the 2001 DCR included a minimum programme (mandatory for all MS) and an extended programme (voluntary), and that the list of indicators correspond to the extended programme list (as seen in table 3.1). This change will in the future give basis for more comprehensive data sets across Europe.

Table 3.1 shows the (socio-)economic data to be collected according to the 2001 DCR (Council of the European Union 2001) and the new DCR in effect from 2009 (Commission of the European Communities 2008a) regarding the fishing industry. The data collected enables the monitoring of the economic viability of the fishing enterprises and to a very limited extent the social viability of the sector (employment), whereas no data on cultural viability are collected.

[8] See appendix 1 for the extended programme.

Table 3.1 Socio-economic data collection requirements for Member States. The requirements in the 2001 regulation (minimum and extended programme requirements and the general requirements 2008 (se appendices 1 and 2)

2001 Minimum programme	2001 Extended programme	2008
	Landing per species	
Income	Income (turnover)	Income (gross value of landings, income from leasing of quotas, subsidies and other income)*
Production costs	Production costs	
	- Crew	Personnel cost
	- Fuel	Energy cost
	- Repair and maintenance	Repair and maintenance cost
	- Other operational cost	Other operational cost (variable and non-variable costs and lease payments)
Fixed costs	Fixed costs	
		Capital cost
		Capital value (value of physical capital and, quotas and fishing rights)
Investment	Investment (asset: hull of vessel, various engines and refrigeration/ freezing, storage and lifting equipment)	Investments
Financial position	Financial position	Financial position
Employment	Employment	Employment (engage crew etc.)
	Fleet	Fleet (number, length, tonnage etc.)*
	Effort	Effort (days at sea and consumption)*
		Number of fishing enterprisers
Prices per species	Prices per species	Production value per species (value of landings and average price)*

All data according to the 2008 DCR are reported at level of fleet segment and supra-regions - except for indicators marked "", where some of the specified indicators are reported at lower aggregation level and frequency.*

The socio-economic information required under the 2001 DCR programme was provided for 13 fleet segments, each in 4 length groups for every country (Appendix 3). The data made it possible to

track trends in the economic performance of the various fleet segments (as shown in chapter 4). Under the extended programme regionalised data were provided on sea-areas (ICES squares) as regards fishing vessels and NUTS 3 regions as regards fish processing industry.

The economic fleet data are slightly extended under the present programme. All fleet data are reported for the same 13 fleet segments, in 6 length groups and for the belonging to one of three supra-regions (Appendix 4). For most countries the fleet is only related to one of the three supra-regions: the "northern seas" (Baltic Sea, North Sea, Eastern Arctic Atlantic and North Atlantic), the "southern seas" (Mediterranean Sean and Black Sea) or "other regions". This enables regionalisation of the data (at supra-regional level) and allocation of the fleet to the supra-regions for the border countries. The member states are free to further disaggregate the data into other than the 6 length groups if this is appropriate (Commission of the European Communities 2008a, chapter III). The fleet data are collected for all active vessels, generally on a yearly basis, but some data are collected at a higher frequency and reported at a lower aggregation level (metier and fleet segment).

The socio-economic data collected within the DCR framework is primarily of economic character, with indications of employment in the sectors as the only social indicator. The data collection opens up for possibilities to disaggregate to fleet level, however. The economic data are reported in the Annual Economic Report (Economic Performance of Selected EU Fishing Fleets). The STECF (Scientific, Technical and Economic Committee for Fisheries), which reviews the report, recognises this as the only compilation of economic statistics available to researchers, fisheries administrations and stakeholders. But they underline that the report should not be considered as the only source of economic information. Partly because the segmentation in the AER (Annual Economic Report on selected European fleets) may not be appropriate for specific evaluations it may be necessary to launch other calls of data in order to get appropriately detailed data for the specific purpose (Commission of the European Communities 2008b).

Despite of the regional approach of the DCR from 2008, the data cannot be disaggregated to a community level. Likewise it is recognised by the STECF subgroup on economic assessment (SGECA) that regarding social indicators variables other than those collected for the DCR might be of great importance in fisheries, and they recommend a study group to consider social indicators, sources of information and suitable ways of collecting such data (Anon. 2008; Commission of the European Communities 2006).

No data on the aquaculture industry in the EU was collected until 2008. Until 2007 it was voluntary for the member states to collect data on the fish processing industry, so there seems not to be useful data covering the entire EU yet. It is hoped that the member state collection of data on fish processing industry and aquaculture as from 2009 will provide useful data.

The type of problems experienced in regard to local disaggregation is expected to also occur in regard to the fish processing industry and aquaculture data. The list of data to be collected is shown in table 3.2.

Table 3.2 Socio-economic data (economic variables) for the fish processing industry and aquaculture to be collected by Member States according to the requirements of the 2008 regulation

Processing industry	**Aquaculture**
Income (turnover, subsidies and other income)	Income (turnover, subsidies and other income)
Personal cost (wages and salaries of staff, imputed value of unpaid labour)	Personal cost (wages and salaries of staff, imputed value of unpaid labour)
Energy costs	Energy costs
Raw material costs	Raw material costs (livestock and feed costs)
Other operational costs	Other operational costs
Capital costs (depreciation of capital, financial costs)	Capital costs (depreciation of capital, financial costs)
Extraordinary costs	Extraordinary costs
Capital value	Capital value
Net investments	Net investments
Debt	Debt
	Raw material value (livestock, fish feed)
Employment	Employment
Number of enterprises	Number of enterprises

3.3 Level 3 objectives

The fulfilment of the CFP objective 3 at the individual RAC level would require an economically efficient segmentation of the fishing fleet in the medium term and that each fishing vessel is efficient in its application of means of production also in the short term. This implies that the fishing operations in each of the RAC areas would be undertaken by a fishing fleet that comprises an optimal mix of vessels of different sizes and fishing technologies in relation to the targeted fish stocks and the level of exploitation decided.

At this point in time none of the RACs has formulated level 3 objectives specifying in greater detail the level 2 objectives. A possible wording of level 3 objectives might be:

- *To develop an optimally diversified fishing fleet in the ……RAC area where the individual vessels are viable and economically efficient.*

- *To develop an optimally diversified regional fish processing industry where the individual enterprises are viable and economically efficient.*

- *To develop an optimally diversified regional aquaculture industry where the individual enterprises are viable and economically efficient.*

4. Economic performance indicators

Fishery is primarily a commercial activity, and indicators of economic performance should be included in any ecosystem-based fisheries management indicator system. As mentioned in the IAD framework presented in chapter 2, the economic outcome of the fishing activity strongly influences the behaviour of the fisher. Unfortunately, the IAD framework cannot tell us if a low economic performance would lead to a lower fishing pressure (due to exit from the sector) or to higher fishing pressure (as the fishery will be intensified to ensure an increased economic output in the next period).

4.1 Fishing fleet economic performance indicators[9]

A report on 'Economic performance of selected European fishing fleets'(the AER) in 2005 was prepared by a number of European fisheries research institutions contracted by the DG Fish. This was a continuation of three Concerted Actions, which produced similar reports for the years 1996-2004. The reports are based on DCR Extended Programme data. The methodology in producing these reports was refined over the years and ended up as a highly effective process. Most of the performance indicators are analysed at EU and country levels. However, as fleet data are also available on ICES square level some regional analysis has been made as well.

Change in the organisation of preparing the reports has questioned the continuation of the data collection and analysis of fleet economic performance. Since 2006 it has been the responsibility of the DG Fish with the assistance from the JRC (Joint Research Centre) to prepare an annual report on EU fishing fleet performance based on DCR data and the STECF/SGECA to review the reports.

The report on the EU fishing fleet performance in 2006 is rather incomplete compared to previous years (Commission of the European Communities 2007). The same applies to the EU overview, and no regional analysis has been made. The report on fleet economic performance in 2007 – even if more complete – also suffers from these shortcomings (Commission of the European Communities 2008c).

Fleet performance at EU level

Economic performance of individual fleet segments can be evaluated in the short and medium term.

For the short-term performance, gross cash flow[10] can be compared to the average gross cash flow. Gross cash flow is a good short-term indicator in fisheries. Positive gross cash flow means that the fishing enterprise is capable of paying for all of its operational costs and meeting at least part of its obligations to its creditors. Empirical research shows that fishing enterprises can survive short-term (1-2 years) losses as long as the cash flow remains positive. The short-term performance can be divided into three performance classes as shown in table 4.1: Improvement, Stability, and Deterioration.

Short-term performance (stp) = Gross cash flow this year/Average gross cash flow previous years.

[9] The text in this section is based on the report "Economic Performance of Selected European Fishing Fleets, Annual Report 2005" (Anon. 2005).

[10] Value of landings minus all expenses. This amount is available to cover capital costs – depreciation and interest, which is not included in the gross cash flow.

Table 4.1 Classification of short-term performance

Range	Classification	Symbol	Comments
Stp >= 105%	Improvement	+	Gross cash flow of actual year exceeds the previous years by more than 5%.
95% <=stp< 105%	Stability	+/-	Gross cash flow of actual years within +/- 5% of previous years.
Stp < 95%	Deterioration	-	Gross cash flow of actual year is more than 5% below previous years.

For the medium term performance (3-5 years), the average realized revenues can be compared to the required 'break-even revenue'[11]. The break-even revenue represents a level of production at which all costs are covered, so that the segment could implement regular replacement investments in the long run.

Here the four performance classes are “strong”, “reasonable”, “weak”, and “very weak” (cf. Table 4.2). To fulfil the economic efficiency criterion in the CFP objective 3 the performance of the EU fishing fleet should be classified as “strong”.

Medium term indicator (mti) = Average revenue/Break-even revenue

Table 4.2 Classification of medium term performance

Range	Classification	Symbol	Comments
Mti >= 105%	Strong	++	Enterprises have no problems in meeting all their financial obligations.
95% <= mti <105%	Reasonable	+	All costs are more or less covered at low level of profits or losses.
85% <= mti < 95%	Weak	-	Minor losses lead to deterioration of solvability.
Mti < 85%	Very weak	-	Losses, probably also in fiscal terms, have been incurred in previous years. The commitment of financial institutions to support the enterprise may be gradually eroded.

The tables 4.3, 4.4 and 4.5 present the trends in the short and medium term economic performance of the total EU fleet in 2004, compared to the years 2001-2003.

[11] Revenue level at which all costs are covered and net profit is zero.

Table 4.3 Medium and short term performance of 89 EU fishing fleet segments in 2004 (number of segments)

Medium term *	Short term				
	Deterioration (-)	Stable (+/-)	Improvement (+)	Not available	Total
Very weak (--)	19		2		21
Weak (-)	5	1	1		7
Reasonable (+)	7	1	3		11
Strong (++)	21	5	8		34
Not available		1		15	16
Total	52	8	14	15	89

* average 2001-2003

The tables inform that only 34 of totally 89 fleet segments, representing 56% of the landing value and 58% of the employment in the EU fleet, showed strong economic performance in the medium term (2001-2003). Of these 21 segments experienced deteriorating economic performance in 2004, while only 8 segments were able to improve their situation in that year. Of the remaining 55 fleet segments 28 showed very weak or weak performance in the medium term and only 11 segments a reasonable performance. Table 4.3 thus clearly indicates that the CFP objective 3 was not met by a large part of the EU fishing fleet in 2004.

Table 4.4 Medium and short term performance of 89 EU fishing fleet segments in 2004 (per cent of value of landings; EU = 100%)

Medium term *	Short term				
	Deterioration (-)	Stable (+/-)	Improvement (+)	Not available	Total
Very weak (--)	13		1		14
Weak (-)	7	0	2		9
Reasonable (+)	6	3	4		14
Strong (++)	34	20	3		56
Not available		0		8	8
Total	59	23	10	8	100

*average 2001-2003

Table 4.5 Medium and short term performance of 89 EU fishing fleet segments in 2004 (per cent of employment; EU = 100%)

Medium term	Short term				
	Deterioration (-)	Stable (+/-)	Improvement (+)	Not available	Total
Very weak (--)	13		1		14
Weak (-)	2	0	1		3
Reasonable (+)	6	1	4		11
Strong (++)	30	25	3		58
Not available		0		14	14
Total	50	27	9	14	100

Performance at RAC level

The performance of the EU fishing fleet in 2004 can be broadly divided into the six main regions of the North Sea, the Baltic Sea, the Northern, Central and Southern Atlantic and the Mediterranean. Fleet segments that operate in two or three regions during the year are included in the regions which are the most important for their earnings. A summary of the regional performance data is presented in table 4.6.

Table 4.6 Performance indicators of the EU fishing fleet by sea area in 2004

	North Sea	Baltic Sea	North Atlantic	Central Atlantic	South Atlantic	Mediter ranean	Other	Total
Number of segments	16	30	16	9	6	8	2	87
Value of landings (mEUR)	824	204	1,614	616	199	1,393	164	5,013
Gross cash flow (mEUR)	89	24	314	46	27	473	27	1,000
Net profit (mEUR)	-79	-16	25	-21	-7	369	-10	262
Gross value added (mEUR)	372	82	893	252	109	878	72	2,657
Employment on board	6,906	8,681	12,791	7,497	6,437	35,399	773	78,484
Volume of landings (1000t)	1,146	699	3,772	212	159	292	534	6,814
Number of vessels	2,013	4,301	2,816	1,727	629	14,927	20	26,433
Total kW (1000)	753	467	1,134	406	180	1,231	112	4,282
VL / man (1000 EUR)	119	23	126	82	31	39	212	64
GVA / man (1000 EUR)	54	9	70	34	17	25	93	34
kW / vessel	374	109	403	235	286	82	5,590	162
VL / vessel (1000 EUR)	409	47	573	357	316	93	8,185	190
VL / kW (EUR)	1,095	436	1,423	1,518	1,104	1,132	1,464	1,171
VL / tonne (EUR)	719	291	428	2,914	1,251	4,765	306	736

VL = value of landings, GVA = gross value added

a) German North Sea trawlers and Swedish Cod trawlers > 24 m are excluded due to insufficient data.

Details of the fleet performance per region/sea area are shown in tables 4.7 through 4.12.

North Sea (ICES area IV and IIIb – Skagerrak and Kattegat)

Table 4.7 highlights changes in the economic performance of 17 North Sea segments. Only 4 segments (24%), representing 17% of the total value of the landings, showed strong performance in the medium term and 3 of them had their performance deteriorating in 2004. Half of the segments showed weak or very weak performance in the medium term.

Table 4.7 North Sea fishing fleet, short and medium term performance (number of segments and value of landings), 2004

Medium term	Short term				
	Deterioration	Stable	Improvement	Na	Total
			Number of segments		
Very weak	7				7
Weak	1				1
Reasonable	2	1	1		4
Strong	3		1		4
Na				1	1
Total	13	1	2	1	17
			Value of landings (mEUR)		
Very weak	303				303
Weak	67				67
Reasonable	77	165	64		306
Strong	136		12		148
Na				24	24
Total	583	165	76	24	848

List of North Sea segments

Belgium	*Germany*	*United Kingdom*
Beam trawlers < 24 m	North Sea trawlers	Scot. demersal trawlers < 24 m
Beam trawlers > 24 m	Shrimp beam trawlers	Scot. demersal trawlers > 24 m
Shrimp beam trawlers		Scottish seiners

Denmark	*Netherlands*
Danish seiners	Beam trawlers <= 24 m
Gillnetters	Beam trawlers > 24 m
Purse s. / trawlers >= 40	Shrimp beam trawlers < 24 m
Trawlers < 24 m	Trawlers > 24 m
Trawlers 24 - < 40 m	

Baltic Sea (ICES area IIIb-d)

Table 4.8 Baltic Sea fishing fleet, short and medium term performance (number of segments and value of landings), 2004

Medium term	Short term				
	Deterioration	Stable	Improvement	Na	Total
		Number of segments			
Very weak	7		1		8
Weak	1	1			2
Reasonable					
Strong	6	1	4		11
Na		1		9	10
Total	14	3	5	9	31
		Value of landings (mEUR)			
Very weak	71		3		73
Weak	4	1			5
Reasonable					
Strong	57	5	32		94
Na		7		29	36
Total	132	14	35	29	209

In the Baltic fleet 11 of 31 segments (45% of total landing value) showed strong performance in the medium term, while 11 showed weak or very weak performance.

North Atlantic (ICES areas I-V excl. the North Sea)

Table 4.9 North Atlantic fishing fleet, short and medium term performance (number of segments and value of landings), 2004

Medium term	Short term				
	Deterioration	Stable	Improvement	Na	Total
	Number of segments				
Very weak	3				3
Weak	1		1		2
Reasonable	2		2		4
Strong	5	2			7
Na					
Total	11	2	3		16
	Value of landings (mEUR)				
Very weak	199				199
Weak	123		101		224
Reasonable	63		150		212
Strong	458	520			978
Na					
Total	843	520	251		1614

The performance of the North Atlantic fleet shows little difference from other EU fleets. Out of 16 the 7 segments, representing 61% of the landing value, showed strong performance in the medium term. Of these 5 segments experienced deterioration in 2004 and no one had improvement in performance.

For the Central and South Atlantic the fleet performance in 2004 shows an even bleaker picture as regards the number of strong fleet segments: that is 3 of 9 and 1 of 6 respectively. All of them experienced deterioration in economic performance in 2004.

Central Atlantic (ICES areas VI, VII and VIII a, b, d) and South Atlantic (ICES areas VII c, e, IX and X)

Table 4.10 Central Atlantic fishing fleet, short and medium term performance (number of segments and value of landings), 2004

Medium term	Short term				
	Deterioration	Stable	Improvement	Na	Total
	Number of segments				
Very weak	1				1
Weak					
Reasonable	1				1
Strong	3				3
Na				4	4
Total	5			4	9
	Value of landings (mEUR)				
Very weak	81				81
Weak					
Reasonable	65				65
Strong	302				302
Na				168	168
Total	448			168	616

Table 4.11 South Atlantic fishing fleet, short and medium term performance (number of segments and value of landings), 2004

Medium term	Short term				
	Deterioration	Stable	Improvement	Na	Total
	Number of segments				
Very weak	1		1		2
Weak	1				1
Reasonable	2				2
Strong	1				1
Na					
Total	5		1		6
	Value of landings (mEUR)				
Very weak	4		46		50
Weak	12				12
Reasonable	103				103
Strong	34				34
Na					
Total	153		46		199

Mediterranean Sea

Only in the Mediterranean Sea did the majority of the fleet segments (7 out of 8) show strong economic performance in the medium term (2001-2003). These segments represent 88% of the total catch during the period. Of these segments 3 improved their economic performance in 2004 while only 2 experienced deterioration in performance. From these data it appears that only the Mediterranean fishing fleet met the CFP efficiency criteria in the period analysed.

Table 4.12 Mediterranean fishing fleet, short and medium term performance (number of segments and value of landings), 2004

Medium term	Short term				
	Deterioration	Stable	Improvement	Na	Total
		Number of segments			
Very weak					
Weak					
Reasonable					
Strong	2	2	3		7
Na				1	1
Total	2	2	3	1	8
		Value of landings (mEUR)			
Very weak					
Weak					
Reasonable					
Strong	671	459	94		1,224
Na				168	168
Total	671	459	94	168	1,393

List of Mediterranean segments

Italy	*Greece*
Mediterranean trawlers	Thermaikos trawlers > 24 m
Midwater pair trawlers	Thermaikos trawlers < 24 m
Purse seiners	
Small scale fisheries	
Dredgers	
Multipurpose vessels	

4.2 Economic performance of the fish processing industry

Fish processing industry

The DCR socio-economic data on the European fish processing industry is listed in Table 3.1 above. With the revised DCR the data requirements from 2008 has increased significantly and now includes a specification of production costs (Council of the European Union 2008).

The fish resource policies in EU waters only to some extent impacts on the socio-economic performance (and localization) of the European fish processing due to the high and ever increasing level of imported raw material to the industry. Table 4.13 shows the dependency of EU North Sea Member States on the import of raw materials for processing. This indicates that the development in the fish processing industry is to some extent decoupled from the development in the resource situation in EU waters. With the decreasing amounts of fish landed by local/regional fishermen, the processing industry has adopted a global sourcing strategy (Salz et al. 2006). However it should be mentioned that the import share is an estimate only, and that part of the fish import in one country originates from neighbouring countries fishing in the same waters as the national fishermen. The importance of the regional fish resources for the supply to the processing industry is therefore higher than what table 4.13 would indicate.

Table 4.13 Import share of fish raw material supply to the fish processing industry in the EU North Sea member states in 2004

North Sea Member State	Import share	Comments
UK	65% of the industry dependent on imports.	Smaller, coastal-based primary processing largely on local landings.
Denmark	Approximately 50% of raw material imported.	Most industries use both domestic and imported raw material.
Germany	Degree of import vs. local landings not clear. Frozen filleted sea fish is the main import product. Approxi-mately two-thirds of the German imports originate from non-EU countries.	Norway is the most important trading partner, followed by Denmark and the Community of Independent States.
Netherlands	The Dutch processing industry uses over 50% imported raw material.	Primary processing of shellfish and flatfish is dependent on local landings.

Source: Salz et al. 2006, p 51-52

5. Socio-economic indicators[12]

A framework to assess the socio-economic impacts of changes in the fisheries has been developed in 2007 by the North Sea Women's Network with funding from DEFRA.

The North Sea Women's Network dataframe project has identified indicators for describing the fishing industry, the fishing community and the institutional arrangements in the fisheries sector (North Sea Women's Network 2007). The dataframe concept thus offers a framework for describing the manufactured, human, and social capitals characterizing the fisheries sector at different management levels and the institutional arrangements.

5.1 The dataframe project

The project departures from stating that easily accessible, policy-facing and relevant socio-economic information is critical to the development of sound management advice in support of sustainable fisheries. However, social data relating to European fisheries and fishing communities tends to be piecemeal, suffers from incompatibility within and across member states, and is inaccessible to decision-makers and other interests. The social information available also lacks the detailed and rigorous analysis reserved for biological data relating to stock assessments and TAC-setting. More importantly, there is no established, all-encompassing structure for incorporating social and economic information into evaluations of fisheries management policies and regulations. This is despite the existence of the EU CFP commitment to "take account of social, economic and environmental factors in a balanced manner" (Council of the European Union 2002).

The dataframe project has the intention to provide a) an information structure within which socio-economic information relating to fisheries and fishing communities can be stored and maintained and, b) an interface by which the data can be both accessed by and presented to policy-makers, industry and other stakeholders.

The dataframe project has employed a combination of literature review, case-study field research and project workshops to achieve its aim.

5.1.1 The literature review

The first step in the project was to conduct a literature review on the organisation and use of socio-economic data in fisheries management worldwide. It was apparent that the main use of socio-economic data in fisheries management, apart from the simple accumulation of statistics, was in relation to policy impact assessments.

The literature review gave basis for a number of conclusions in regard to fisheries policy in general, and to the development of the dataframe:

- Socio-economic data is already being used in fisheries management decision-making, although the only established wide-ranging socio-economic data system in fisheries is the Community Profile system in the US.
- Socio-economic data includes industrial, community and institutional information, but social data is less readily available than economic data. For example, few attempts have

[12] This chapter is based on North Sea Women's Network 2007, the report "Developing a Socio-Economic Dataframe".

been made to chart the historical socio-economic impacts of changes to fisheries management regimes and fishing opportunities.

- There is a significant and growing demand for reliable socio-economic data as impact assessments of policies, for example MPAs, become the norm. Socio-economic data held by decision-makers tends to be at a broad, often national scale, produced by offices for statistics. This is insufficient to meet the needs of impact assessments.
- Data can be organised, accessed and understood via systems of databases, indicators and profiles and can take the form of statistics, narratives, maps, graphics and tables.
- Institutionalising socio-economic analysis requires prioritisation in terms of time and resources at a policy level. Local participation can play an important role in data collection and management, although socio-economic expertise is also necessary to ensure correct interpretation of data that has been collected.

5.1.2 The case studies

The second step in the project was to conduct three case studies in the UK with the purpose of testing a dataframe concept, partly developed based on the literature study, and to see how accessible and how well documented socio-economic data within fisheries and fishing communities would be.

The case study phase entailed data collection and recording, as well as analysis of the research process. The draft dataframe had a spreadsheet format, which was divided into industry, community and institutional datasheets for current and historical information respectively. The researchers spent 8-10 day conducting the fieldwork and recording findings in each case study.

Case study conclusions:

- There are significant amounts of industry, community and institutional socio-economic data available relating to UK fisheries and fishing communities: fleet data provided by fisheries management institutions; catching sector employment data; population statistics from the decennial census; and social policy and fisheries governance arrangements.
- This information can be broadly categorised according to its source: catching sector and general population statistics are accessible from official sources, public websites are particularly useful for obtaining institutional information, and local knowledge is necessary to gain access to information on non-fleet fishery sectors and of social networks operating in communities.
- Other types of data will require further research: data on the onshore sectors of the fisheries industry is piecemeal; business data is commercially sensitive and not publicly available; population data specific to fisheries and fishing communities is unavailable; information on some aspects of community is not systematically collected by all local authorities or by national governments, including working conditions and job satisfaction; social well-being data, for example, relating to family status, job satisfaction, values and identity and social networks is largely absent for both fisheries and the wider community; and information on social networks is piecemeal.
- The scale and transferability of data included within the final dataframe will be important. For example, aggregated datasets are sometimes not at the appropriate community scale. Therefore, the geographical scale and boundaries of communities need to be established with a view to available data and it should be considered how the field research methodology and the structure of the dataframe could be refined to reflect local circumstances.

- Researchers in the three locations made recommendations for changes to the dataframe structure: the dataframe should be broken down into smaller units using multiple tables within each of the industry, community and institutional arrangement sections of the dataframe; different formats should be used for quantitative and qualitative data; sources need to be explicitly and simply indicated; and historical data should not be separated from current data.
- A research period longer than 8-10 days would allow both current and historical information to be obtained from local organisations and via local knowledge, and facilitate cross referencing and validation from more than one source on certain data types. However, the correlation between usefulness of data and time taken to obtain it should be considered.
- The researchers' own knowledge and access to networks within the community is important because knowledge of the local situation is required in order to interpret data obtained.

5.2 The dataframe approach

5.2.1 Data collection and purpose

A key conclusion to emerge from the fieldwork and literature review process was that it is advisable to structure the dataframe around data that can be accessed and is meaningful. This includes both quantitative and qualitative data; the need to make the most of local knowledge; the incorporation of general community data in addition to sector-specific data; and the need to distinguish between data that needs close monitoring and data that can be updated on a less frequent basis.

To address these points, the project found that socio-economic data collection will require two elements. First a baseline study of each community/sector to underpin socio-economic profiles. Second an annual data collection programme. Data gathered via this process will be used to monitor key socio-economic indicators of industry, community and institutional arrangement aspects of fishery socio-economics.

The project developed a model of the relationship between the elements, figure 5.1.

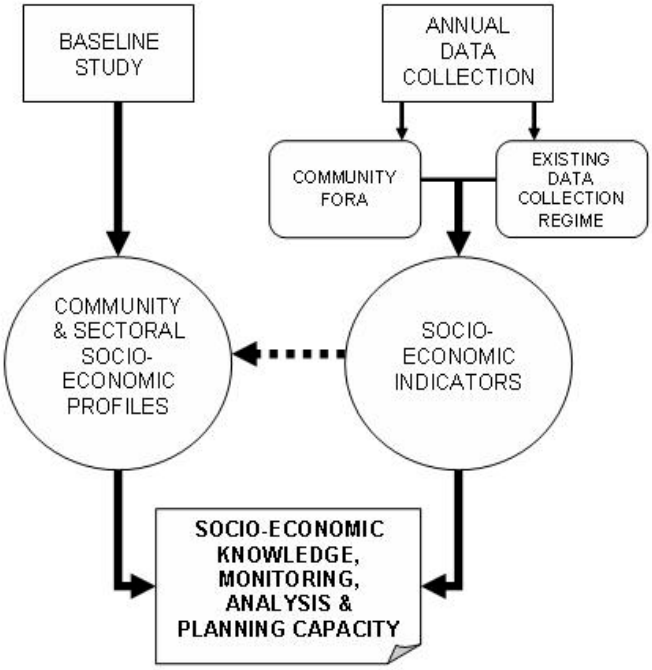


Figure 5.1 Data collection process and purpose overview in the dataframe project

Baseline studies and profiles

The study found that the baseline socio-economic data should be collected in the first instance to improve policymakers' understanding of the socio-economic circumstances of fishing communities and sectors. The most appropriate way to achieve this was seen as conducting a large-scale baseline study in a similar way as the case study research in the dataframe project.

The baseline study should provide sufficient information to construct and maintain socio-economic profiles of fishing communities and sectors. Community/sector profiles would constitute a predominantly qualitative textual description. They would refer to industry (for example, key species, size of industry, local facilities, profitability, links to other communities/sectors), community (for example, a general community description, access, alternative employment, social networks) and institutional arrangement (for example, recent social/fisheries projects, descriptions of fisheries governance arrangements and access of the industry to them) aspects of fishery socio-economics as listed in Table 5.1. Such combination of quantitative statistics and qualitative data would allow a reflection of local experience and perceptions. To ensure that these profiles remain an accurate reflection of the socio-economic circumstances of a sector or community, the baseline data needs to be checked and updated on a five-year basis. Significant changes would need to be recorded more immediately.

Table 5.1 Industry, community and institutional arrangements socio-economic baseline data

Industry Baseline Data		
Fisheries	• species seasonal variation • vessel statistics (age, length, tonnage)	• fishing grounds • fishing gears • facilities, e.g. ice, fuel
Onshore and catching sectors	• number and location of businesses • interconnections between sectors	• average employment per sector
Safety	• accident statistics	• safety programmes
Community Baseline Data		
Population (fisheries and general)	• number of people gender age • employment	• education • health • ethnic diversity
Social well-being (fisheries and general)	• family status social networks (what, where, who, how long, why?)	• cost of living (quantitative)
Institutional Arrangement Baseline Data		
Community social institutions and agencies (e.g. business/employment support, education, health)	• number location budget scale scope	• fisheries specific measures/projects research investment training provision staff
Fisheries management institutions	• number • location • budget • scale	• scope • regulatory instruments • staff

Annual data collection and indicators

In addition to baseline data, some data types will need to be collected annually. Data collection related to the European Common Fisheries Policy was until recently governed by what is known as the Data Collection Regulation, which detailed the specific data that Member States were required to collect regarding fisheries. This was established in 2000 (Council of the European Union 2000) and guidelines for its application were published in 2001 (Council of the European Union 2001) and subsequently amended in 2004 (Commission of the European Communities 2004). These regulations limited the collection of fisheries socio-economic data to fleet-based, (mainly) economic and quantitative information, such as volume of catch, prices, discards levels, income derived from fishing activities, production costs and employment levels.

However, the Data Collection Regulation has been revised in 2008 (Council of the European Union 2008) as mentioned in chapter 3. The aim of the revision has been to develop long-term, well integrated regional sampling programmes covering biological, economic, environmental and social data. The data to be collected are specified in a decision of November 2008 (Commission of the European Communities 2008a).

As shown in Table 5.2 a list of seven socio-economic indicators for fisheries communities and sectors has been devised: 1) profitability; 2) fisheries related activity; 3) economic value; 4)

population; 5) social well-being; 6) social policy; and 7) fisheries governance. These span industry, community and institutional aspects and require both quantitative (such as that traditionally collected under the Data Collection Regulation) and qualitative socio-economic data. They also require data to be collected at the community scale. Without this local-scale data, the analysis of socio-economic impacts of policy on fishing communities would not be possible. The data variables connected with each of these indicators are detailed below.

The annual quantitative data requirements can be fulfilled via the existing systems in place in Member States for data collected in association with the CFP. However, the addition of qualitative data will require new methods of data collection. To address this, the concept of community fora, such as panels or focus groups, has been proposed. It is recommended that a fisheries panel be set up to provide a representative picture of people involved in the wider fisheries context, including industry, community and institutional settings.

The panel participants would need to have experience and views on an array of issues (ranging from fisheries topics to more general community dynamics). This fixed panel could then regularly (annually) be solicited to comment on trends in predefined indicators. For example, in the case of social well-being: quality of life, job satisfaction, general happiness, community connectedness, political or management influence and self-determination.

A special case of the panel is the ad hoc focus group (group discussion). Similarly to the panel, the focus group brings together a range of interested parties, who are asked to discuss specific topics (for example potential impact of measures proposed). This method is very much appropriate for taking an inventory of opinions and to bring to light the underlying motivation of actors involved.

Table 5.2 Industry, community and institutional arrangements socio-economic indicators

Industry Indicators (community-scale information to be gathered annually via existing data collection routines)	
Profitability	• costs/earnings per sector • general local economic performance
Fisheries-related activity	• number of businesses • full-time/part-time employment by gender, age, nationality per sector • % total local employment
Economic value	• economic value per local sector • % economic value relative to total sector • % local GDP from fisheries
Community Indicators (qualitative data to be gathered annually via community fora)	
Population (fisheries/general)	• community size • community diversity • community skills • employment/training opportunities
Social well-being (fisheries/general)	• job satisfaction • cost of living (qualitative) • perception of choice community-identity fit
Institutional Arrangement Indicators (qualitative data to be gathered annually via community fora)	
Social Policy	• accessibility of advice, support and funds • degree of advice, support and funds
Fisheries Governance	• understanding of fisheries management • perception of fleet restrictions • legitimacy of fisheries management • participative opportunities in fisheries management

In addition to the provision of time-series social data indicating trends from year to year, these kinds of community fora would provide a basis for capacity-building and the accumulation of knowledge and expertise within fishing communities. They would provide a means by which trends in experiences of social and cultural aspects of community life could be judged. And they would also provide a means by which to compare statistical socio-economic trends and popular perceptions. A methodology to achieve this and to quantify the qualitative data will need to be developed. However, if it is judged that this type of system is too expensive, an alternative option would be to select representative fishing communities where the panels would take place, in addition to a panel for each fleet/industry sector.

The seven socio-economic indicators will provide a critical link between fleet segments and other aspects of the fishing industry and communities. These indicators would be underpinned by data-sets on related variables. For example, *profitability* could be an indicator, with associated data-sets on costs and earnings. *Population* could be another indicator, with data-sets on number, gender, age, employment, education, health and ethnic diversity. These indicators and their associated data-sets would provide time-series socio-economic information to support both policy-making and socio-economic impact assessments.

The indicators reflect the lessons learnt from the literature review, for any such data (if it is to be worthwhile collecting) to be relevant for the foreseeable future, able to support decision-making on

general fisheries and social policy, and to support assessment of impacts of specific management instrument proposals. Obtaining the relevant data will require additional quantitative data-collection requirements to be added to the existing fisheries data collection system and a new system of qualitative data collection to be established and developed.

Data transferability

The data also needs to be relevant across Member States and in principle, a common toolbox box which would be applicable across a variety of contexts and scales, is possible. This toolbox needs to include both quantitative and qualitative data (albeit some of which will be quantitatively expressed), and both of these data types could be used to judge trends and to access community/stakeholder opinion. Ensuring that the selected indicators are wholly suitable is likely to require further exploration of fisheries sectors and communities and their associated data availability in other North Sea countries. The case study research process could be replicated in other countries to achieve this. In the long run, given the common status of fisheries resources, it will be necessary for all Member States to apply the same data definitions in order to ensure that a common system of socio-economic analysis is used. Where there is significant diversity in experience, this could be dealt with by including additional country-specific questions to the baseline and community panel data collection processes.

Confidentiality of data

The issue of confidentiality would be addressed by adopting the current standard approach to sensitive data in European fisheries management. The raw data, which would be collected under the terms of the new Data Collection Regulation (Council of the European Union 2008; Commission of the European Communities 2008a), would be the responsibility of the Commission and Member States, and only released temporarily to researchers addressing specific questions. For example, the data could be released to STECF working groups, to social scientists who have been asked to look at impacts by Regional Advisory Councils, or by civil servants undertaking policy research. The public face of the dataframe would only feature aggregated data and the reports of any researchers with access to the raw data would also only feature aggregated data. However, if agreed upon, and in order to make evaluations open, participatory, transparent and conducive to stakeholders interpretation, it would be worthwhile to make data available to all involved in the process of assessing the impact of a proposed measure.

The dataframe structure, appearance and use

Further the project considers how the collected data should be structured in databases and how they should be presented in order to be useful. Based on experiences from the pilot study it is concluded that the dataframe also will be a dynamic tool that provides the capacity for the interconnections between data, profiles and indicators. The pilot study illustrated that the data should be broken down into smaller tables as multiple formats are essential, particularly to address the necessary combination of qualitative and quantitative data that characterizes socio-economics and in order to address both specific impact assessment queries and more general policy-making issues. Multiple formats are also necessary to provide easy access to a range of potential user-groups.

The pilot study proposes the dataframe to be accessible via a public webpage with four layers of information:

1. A North Sea region map with hyperlinks to different communities, sectors, regions and countries.

2. A profile for each community, sector, sub-national region or country acting as a gateway to the data. In addition to a description of the community or sector, the profile would include a summary of the seven indicators, relevant maps, hyperlinks to aggregated datasets, and a link to a list of hyperlinked bibliographic sources. Also links to other community/ sector/regulatory websites could be included.

3. Aggregated data for each of the seven indicators and baseline information would be accessible in tabular/graphical format, with sources indicated and hyperlinked where relevant.

4. Disaggregated raw datasets would underpin the aggregated data. The two systems would be linked so that updating the raw data would also update the aggregated data and the associated indicators. To protect the integrity and confidentiality of the datasets, this layer would not be publicly accessible without prior agreement.

A possible visual representation can be seen in figure 5.2. The industry, community and institutional arrangement indicators could provide an overview of changes in key features of the socio-economic environment of a fishing community or sector, which is accessible to all users including, for example, stakeholders and policy-makers. The information will support policy development and analysis.

The more detailed data needed to underpin the system (housed in Layer 4) could be used to answer more detailed questions posed by impact assessments, such as the likely socio-economic impact of an area closure or of a reduction in the quota of a particular species. It is likely that these sorts of questions will require more skilled expert analysis of the data. They will also require data to be available at a variety of scales, including the local, as already specified under the heading of annual data collection and indicators.

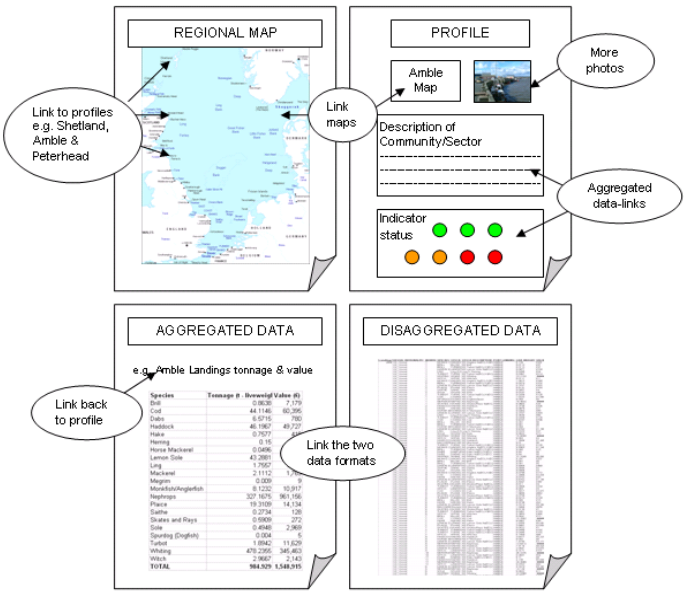


Figure 5.2: Possible outline of a homepage - the four layers of the dataframe

5.3 IMAGE perspectives on the dataframe approach

The dataframe project addresses problems also identified by the IMAGE WP 3 group – the lack of indicators and data which can shed light on those elements which influence behaviour of fishers in the IAD model, identified as the human capital, social capital (at community and state level) as well as institutional arrangements.

The dataframe project has identified seven overarching indicators to be used in baseline studies and in the annual data collection. These indicators seem to be highly relevant in the context of ecosystem-based management. The dataframe project has tested the relevance of the indicators and a method to collect quantitative as well as qualitative data on the indicators at pilot level. However, it remains to be further demonstrated that the same type of data can be collected in other national and local contexts.

Another remaining topic is a further specification of the seven overarching indicators. The dataframe project operates with two levels of indicators: the seven overarching indicators and the sub-set of measurable indicators. The seven overarching indicators represent a higher order or meta-indicators, each describing a field which influence the fisher behaviour (and in second order the fishing pressure). The homepage presentation includes a summary of the seven indicators by traffic light indication of the development trends. The problem is that the dataframe project has not developed a way to convert the results of the measurable indicators (two or more) into a single indication of the development of each of the seven “indicators” (or meta-indicators). The conversion should probably be a kind of index-indicator, which summarises the measurable indicators. This work still needs to be done.

6. The dataframe applied on a case: Thorsminde, Denmark

This chapter provides an example of the use of the dataframe approach on a specific case (Thorsminde in Denmark).

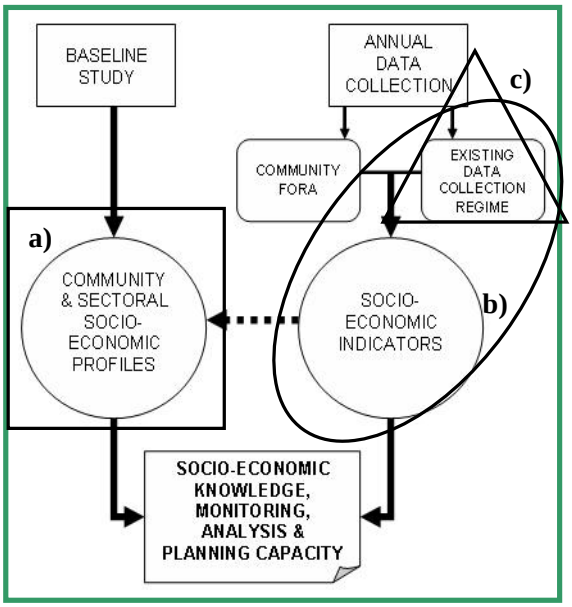
The case consists of three elements as illustrated in figure 6.1:

a) A community and sectoral socio-economic profile of Thorsminde, based on a study conducted by the UNCOVER project (Delaney 2009) which has been adjusted and supplemented for the present purpose (section 6.1).

b) A review of existing data available within the present data collection system in Denmark as regards socio-economic indicators (section 6.2).

c) A comparison of data on socio-economic indicators available within the national data collection systems in Denmark and the UK. The comparison is based on the Thorsminde review in section 6.2 and the conclusions from the dataframe pilot study in the UK conducted by of the North Sea Women's Network (2007) (section 6.3).

Figure 6.1 The dataframe approach applied on the Thorsminde case



The Thorsminde case can be used as one element of a general fishing community database with data and profiles (the box in the bottom of figure 6.1 "Socio-economic knowledge, monitoring, analysis and planning capacity"). However, the case does not reflect the possible organising of a community forum that on a yearly basis could provide data not available elsewhere within the existing data collection system.

6.1 Profile of the community of Thorsminde

Thorsminde, with an estimated population of 478 in 2006, is located on the west coast of Denmark. Until the beginning of 2007, the town was part of the municipality of Ulfborg-Vemb in the County of Ringkøbing. After the 2007 Danish Municipality Reform, the town became part of the municipality of Holstebro within the Central Jutland Region.

Thorsminde is located in what the Danish Regional Growth Strategy Report 2003 (Danish Ministry of Economics and Business Affairs 2003) defines as a 'marginal area' in Denmark (37). These areas are generally found along the west coast of Jutland, across

northern Jutland and also comprise the islands south of Funen, as well as the two large islands of Lolland and Falster, south of Zealand.

These marginal areas, geographically distant from the major urban centres in Denmark, are characterized by a relatively small industrial sector, low productivity, depopulation and an increasing average age of the population, as well as low participation in the labour force. The Growth Strategy Report recommends a variety of measures to be applied in these areas in order to secure a balanced regional development in Denmark. The report also identifies Thorsminde – along with the fishing communities of Hvide Sande, Hanstholm, and Thyborøn – as communities that have been particularly affected by the decline of the North Sea fisheries and therefore are in particular need of measures that would provide industrial restructuring and economic and social development.

The west coast of Jutland, with its clusters of recreational houses/summer houses along the coastline, is a main location for tourism in Denmark. The size of the recreational areas and the housing density varies. The Thorsminde area can be characterized as a rather small area with relatively few summer houses compared to major areas, such as e.g. Løkken and Blokhus.

6.1.1 Demographic and economic characteristics

In 2006, the population of Ulfborg-Vemb municipality was 6,938, and Ringkøbing County 275,065. The average primary income in 2005 was DKK 159,000 in Ulfborg-Vemb municipality and DKK 175,340 in Ringkøbing County. The unemployment rate in the county was 3.4% in 2006 and in the municipality 3.5%. The male to female sex ratio in Ulfborg-Vemb and in Ringkøbing County was 1.01 in 2006. The table below gives some additional information about the Ulfborg-Vemb municipality and Ringkøbing County.

Table 6.1 Demographic characteristics

Employment by industry 2006, Ulfborg-Vemb Municipality		
Sector	# Employed	% Employed
Agriculture, natural resource extraction	349	11.9
Fisheries	100	3.4
Industry	436	14.9
Energy and water supply	14	0.5
Construction	245	8.3
Trade, hotel, restaurants	574	19.5
Transportation	139	4.7
Finance, business and real estate	182	6.2
Public and personal services	882	30.0
Not stated	16	0.5
Total	2,937	100.0

Employment by industry 2006, Ringkøbing County		
Sector	# Employed	% Employed
Agriculture, natural resource extraction	8,751	5.9
Fisheries	934	0.6
Industry	35,155	23.9
Energy and water supply	766	0.5

Construction	9,330	6.3
Trade, hotel, restaurants	27,749	18.9
Transportation	6372	4.3
Finance, business and real estate	13,549	9.2
Public and personal services	44.147	30.0
Not stated	403	0.3
Total	147,156	100.0

Educational attainment (age 18 to 69) Ulfborg-Vemb Municipality		
Primary school	2,038	43.2%
High school	95	2.0%
Vocational training	1,834	38.9%
Short and medium length higher education	498	10.6%
Graduate degree	86	1.8%
Not stated	162	3.4%
Total	4,713	100.0%

Educational attainment (age 18 to 69), Ringkøbing County		
Primary school	71,798	37.6%
High school	6,596	3.5%
Vocational training	74,442	39.0%
Short and medium length higher education	28,587	15.0%
Graduate degree	4,583	2.4%
Not stated	4,803	2.5%
Total	190,809	100.0%

Age structure 2006, Ulfborg-Vemb Municipality		
Age	#	%
0-14	1,342	19.3%
15-44	2,295	33.1%
45-64	2,012	29.0%
65 +	1,289	18.6%
Total	6,938	100.0%

Age structure 2006, Ringkøbing County		
Age	#	%
0-14	55,612	20.2%
15-44	104,109	37.8%
45-64	74,168	27.0%
65 +	41,176	15.0%
Total	275,065	100.0%

Source: Statistics Denmark

Thorsminde is located on the narrow strip of land that separates the North Sea and the shallow Nissum Fjord on the west coast of Jutland. The name of the town testifies to the historical importance of cod fisheries. Its original name was Torskeminde which means cod mouth in ancient

Danish. The town is protected by dikes and since 1931 a permanent sluice has enabled the regulation of the water level in the fjord. The first harbour was constructed behind the sluice in 1934. In 1930, there were already 140 residents in Thorsminde and more than 30 housing units. The number had grown to 363 in 1955 and in 1960 there were 438 residents in 121 households, of which 289 made their living from fishing, 54 were employed in industry, 36 in trade, and 19 in transport (401).

Population

The population of Thorsminde has decreased by 24% over the last 10 years as shown in table 2. In 2005 the migration out of Thorsminde was 9%, of which slightly more than 50% were aged between 25 and 64.

Table 6.2 Population in the community of Thorsminde

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Thorsminde*	557	541	533	510	503	482	Na.	445	442	425

*There may be a slight difference in registration area from 1999-2004 to 2006-2008.
Source: Statistics Denmark, Bef4A and Bef44.BEF4A

Age structure

The age structure in Thorsminde is that of an ageing population. Although a population prognosis made by Ulfborg-Vemb municipality in 2006 predicts a 2% population increase from 2005 to 2015, this increase includes a 16% decrease of residents between 0 and 19 years of age and is primarily based on an 83% increase of residents between 66 and 74 years of age. The same prognosis therefore predicts a drastic reduction in the population after 2015 unless outsiders begin to take up residence in Thorsminde.

Education trends

The municipality amalgamation which took place in Denmark in 2007 threatens the local school as the 7th grade was removed with the amalgamation. So the local school ends at the 6th grade now. As indicated above the number of children for the school is heavily declining.

Household composition

In 2006 there were 268 housing units in Thorsminde. 66 of these housing units were not registered in the National Register of Persons, which can be taken as an indicator that they are used for seasonal and recreational use only. Of the 202 residential households there are 29 renter-occupied housing units and the remaining 173 are privately owned.

Local business

The large majority of - small – businesses are reliant on the summer tourist economy. Apart from the only – small – supermarket, that also runs with reduced opening hours outside season – all the small restaurants and kiosks, are only open during the tourist season. The town's only fishing gear store is open throughout the year, but reports that the sale to tourists provides substantial and critical income supplement to the sale to local fishermen. The town's only pub and restaurant are both owned by those who run the camping ground and are closed during the off-season. Other businesses

in Thorsminde include an accountancy firm, a bank, a hair salon, a ship builder and a machine station. Thorsminde is also home to the St. George Stranding Museum that focuses on the history of shipwrecks on the west coast. The main city in the area is Holstebro, which is 45 km away from Thorsminde.

Fisheries characteristics

The new port – including the auction hall – was built by the Danish state in 1967, and the Thorsminde harbour remains Denmark's only state-run harbour (Danish Coastal Authority). It has a total of four quays with room enough for approximately 50-60 vessels. There is a fee of 2.4% of catch landing value to the port authorities and of 0.4% to the auction house that is run and owned by the local fishermen's organization. There are two fish processing plants in the port as well as a fuel station and a machine shop. In 2003 there were a total of nine businesses in Thorsminde with a total of 50 employees in jobs that were directly related to fisheries. The number of businesses and employees has decreased since 2003, but no estimate of the decrease is available.

The port is used primarily by the local fishermen. During the sole fishing season in the spring, approximately 35 foreign vessels make use of the port. An estimated 150 recreational vessels are using the port every year. The Danish Directorate of Fisheries had registered 121 full-time vessels in Thorsminde in 1995, 61 in 2006 and 48 in 2008. In spring 2009 the private register fiskerforum.dk reported that 28 vessels were registered with Thorsminde as their homeport.

There is a difference between the official registration of vessels and the local interpretation. As an example part of the reduction in the fleet were fiord vessels. As Thorsminde is located between the sea and the fiord, with a harbour to both sides, many fishermen had two vessels. Some fishermen still hold more than one vessel, which can explain that the locals only register 14 active fishermen and vessels in 2009 – half of the official registration.

There is also a number of vessels registered as part-time employment. These vessels are used for occasional fishing in the fiord. The majority of the local vessels are gill netters. Half of them are used for coastal fisheries and the other half for off-shore fisheries.

The most important fisheries in Thorsminde are for cod, plaice, sole and turbot[13] as shown in Table 6.3. These species accounted for 88% of the value of the entire landed catches in Thorsminde in 2006. The most important of these species was plaice: 1,146,409 kg with a total value of 15,319,480 DKK accounting for 39% of the value of the total catches landed. In 2006 404,747 kg of cod was landed, with a value of 12,513,503 DKK and accounting for 31% of the value of the total catch landed.

The cod landings in Thorsminde have also been reduced significantly. 2,719,138 kg of cod was landed in Thorsminde in 1998 with a total value of 47,061,508 DKK. Table 6.3 shows the continuously decreasing landings from 1998 until 2006. While cod was the most important fisheries in 1998, accounting for 73% of the value of the total landings, it had been reduced to 31% in 2006. Alternative fisheries have replaced the cod to some degree – plaice went from 13% to 39%. However, the total value of the landings in Thorsminde has been reduced by 39%, from 64,660,037 DKK in 1998 to 39,840,841 DKK in 2006.

[13] Not including lemon sole

Quota reductions are the most limiting factor for Thorsminde fisheries, rather than days at sea or other forms of effort restrictions.

There is one company which purchases fish in Thorsminde and cuts them into fillets: TM Fisk & Søn, but their raw material primarily comes from the Baltic Sea. TM Fisk is only to a limited degree affected by the North Sea Cod Recovery Plan.

Table 6.3 Landings in Thorsminde 1998-2006 (landings in tonnes, value in million DKK)

		1998	1999	2000	2001	2002	2003	2004	2005	2006
	Landed catch	2,719	2,301	1,422	1,096	1,132	601	623	587	404
	value	47.0	47.6	34.6	31.0	30.8	18.2	16.2	16.7	12.5
Cod	% of total value	72.6	62.2	56.5	44.6	47.9	31.9	34.0	36.0	31.4
	Landed catch	27.5	32.4	28.0	39.0	48.3	50.3	64.8	53.4	43.0
	Value	1.9	2.3	1.8	2.8	3.1	3.9	4.7	4.4	3.7
Turbot	% of total value	2.9	3.0	2.9	4.0	4.8	6.8	9.9	9.5	9.3
	Landed catch	612	746	666	1,153	1,133	1,344	1,021	1,054	1,146
	Value	8.5	11.9	9.0	15.9	13.2	17.9	13.4	13.5	15.3
Plaice	% of total value	13.1	15.6	14.7	22.9	20.5	31.3	28.2	29.1	38.4
	Landed catch	34.2	130.2	207.7	200.4	185.9	156.5	102.1	84.0	38.0
	Value	2.7	8.9	11.7	14.6	12.8	12.0	7.6	6.4	3.6
Sole	% of total value	4.2	11.6	19.1	21.0	19.9	21.0	16.0	13.8	9.0
Table total	Value	60.1	70.7	57.1	64.3	60.0	52.0	41.8	41.0	35.2
Overall total	Value	64.7	76.5	61.2	69.5	64.3	57.1	47.6	46.4	39.8

Source: Ministry of Food, Agriculture, and Fisheries

6.1.2 Fisheries management

The national management system

The Danish fisheries management is based on the EU Common Fisheries Policy. Most of the Danish landings consist of quota regulated species. The TAC for these species is adjusted on a yearly basis according to the EU regulations.

The admission to specific fisheries is limited by licenses or fishing permits. Until 2007 all demersal fishermen with licenses had access to most fisheries. Only blue mussel and horse shrimp fisheries were restricted to certain vessels.

Most fisheries are delimited by control of days at sea as well as technical regulations including mesh size, minimum size, closed areas etc. based on EU regulations.

Until 2006 the detailed regulation of allocation of the TAC to vessel types was decided upon by the Ministry, after consultation with the so-called §6 Committee (committee for the professional fisheries), where the Danish Fishermen's Association had an important word in the implementation of the regulation. The TACs were allocated as permits on a weekly, two-weekly or monthly basis to the vessels, according to their belonging to gear and size defined segments.

Within the last years, individual transferable quota allocation has been introduced in the Danish fisheries. From 2003 a system of ITQs in the herring fisheries was introduced on a trial basis. Based on the positive experiences in terms of fleet economic performance and modernization, the ITQ system was made permanent as from January 2007 and was expanded to include other pelagic species such as mackerel, horse mackerel, sprat, blue whiting and also sand eel.

In January 2007 a system of Vessel Transferable Quotas, VTQs, was introduced in the demersal fisheries and applied to cod, saithe, plaice, haddock, hake, sole, turbot, monkfish, Nephrops, and prawn fisheries that altogether represent 55% of the total value of the Danish fish landings. In the VTQ system shares of the national quotas are allocated to the specific vessel. The shares were allocated based on historical fisheries. In principle the quota could only be sold together with the vessel. In order to get a higher quota, many vessel owners have therefore bought vessels with quotas, in order to fish the whole quota from one vessel. This in itself has lead to a considerable reduction of active vessels[14]. Only few vessels were scrapped, as the days-at-sea were still allocated to the vessel. The days were therefore lost if the vessel was scrapped. A change in the allocation of days-at-sea in 2009 and the untying of quotas from vessels will open up for the scrapping of these vessels.

In order to open up for a more smooth exchange of quotas to fit the fishing capacity of the individual vessel, the VTQ system introduced so-called quota pools. This is an association of fishermen who pool their quotas and internally regulate the use of the quota. This means that the fishermen can loan, lease or swap quotas within the pool as they want, if they just inform the authorities. Some quota pools have collectively bought vessels with quotas, which are shared within the pool. In some ports the pools have been used to secure local landings, by buying vessels that would otherwise be sold out of the local area.

The organization of the fishermen

Most fishermen (vessel owners as well as crew member) are members of the local fisheries association[15], which again is member of the national organization, Danish Fishermen's Association.

The national association plays an important role in the consultative commissions in the national management system (as mentioned above). The national association is also active in regard to negotiations at EU level (e.g. the yearly TAC negotiations) and other regulative matters.

The purpose of the local fisheries association is to promote the interests of the local members in general. The associations are forum for discussion regarding problems of local as well as more general type. Further many local associations are centres for a number of other local fisheries

[14] It is assessed that the real number of active vessels has been reduced by 50% during a period of two to three years. Due to the days-at-sea regulation until 2009 this has not lead to the same reduction in the registered number of vessels.

[15] Until December 2007 the Thorsminde-Fjand Fishermen's Association and since January 2008 the Thyborøn Fishermen's Association.

related activities of which some take place as an activity of the association and others are activities carried out by members as independent activities. Examples of activities within the local association could be funds for fishermen's widows or funds for generation shifts. Some associations also employ consultants who can help in relation to legal problems or in relation to subsidies from the EU structural funds. In other cases the association is co-owner of service companies in the port (e.g. boxes for fish), administers the local quota pool etc. In other words, the local fisheries association is central in a number of local institutions – being of social and/or commercial character. The concrete types of activities differ from town to town, as the activities have been developed based on specific local needs and opportunities.

In Thorsminde the fishermen's association has also played an active role in local development. As an example the fishermen's association in 1999 tried to develop direct sale of fresh fish in Danish supermarkets, based on fish from local fishermen, prepared at the local processing plant owned by the fishermen (Direktoratet for FødevareErhverv 2001).

The local association also framed the scepticism from the fishermen in Thorsminde about the idea of VTQs. They were afraid of what such a system would do to their fisheries. They feared that their small-scale gill net fisheries would be the first to disappear. According to the former chairman of the association, the scepticism was eased when the fishermen learned more about the system and its possibilities for collaboration. The Thorsminde fishermen were among the first to form a quota pool and they tried to organize all local fishermen in this pool in order to avoid that the quotas they had left the port.

Due to a decreasing number of members in the association, the Thorsminde-Fjand Fishermen's Association recently merged with the one in Thyborøn. Even if it is too early to tell what the effect of such a merger will be, the former representative did say that "I do feel that it will become a handicap for Thorsminde". He says this since there is nobody to take over and actively work in the interest of the fishermen. "Nothing has really happened there since I left. Their arms have fallen down completely; they don't do anything. I'm a bit disappointed in that; I had really hoped that the new Thorsminde-people in the organization of Thyborøn would do stuff… it just hasn't happened. We need somebody to catch the ball when it is played instead of just letting it fall down. It is OK for me to have the two fishermen's associations; but I need other people to go into the work too; at least I need people to inform me when I'm not there."

Fisheries and community profile

The existence of Thorsminde is closely tied to the fishing industry. The town began to grow mainly after the first port was built in the 1930s, and in 1960 more than half of the adult population was employed in fishing or fishing-related activities. This importance of – and dependence on – fishing has declined, and today less than 100 residents make a living from fishing. In a similar vein, although all those involved in fishing were generally 3rd generation fishermen, only a handful of them believed that their children would enter into fishing.

All the Thorsminde residents interviewed described the town as a well-functioning community. The citizen's organization has several hundred members and is very active. The Mindbo Centre, a combined institution for elderly people as well as an activity centre for the residents in general, has between 300 and 400 members and offers a wide variety of activities. The town also has a sports complex and offers the members e.g. handball, badminton, and gymnastics. These institutions, as well as the St. George Stranding Museum, organize a range of activities for the different holidays.

Thorsminde organizes a community festival each year (*byfest*, literally city party), and has also recently begun to have a fish auction for tourists and locals on Saturdays in the summertime. It is held at the "Gammel Havn", an old auction hall, which is now only used for cultural purposes, and everything takes place like at a regular auction.

Throughout the interviews citizens, business owners and fishermen from Thorsminde all emphasized the role of fishing in sustaining and preserving their community. Many residents explained that this importance did not exclusively have to do with the number of people making a living from fishing or fisheries-related employment, but that the fishery is a vital part of the larger whole, a whole that needs to maintain a certain size in order to be viable and to survive. As one person explained: "I'm born here, and I've lived here all my life, and I don't want to move." But more and more people – especially the youngsters – are leaving, and many of them are not coming back. If Thorsminde has to continue to be an attractive place to live, and if we want outsiders to settle here or people to come back, then we need to have a well-functioning community. Who wants to live in a community where there's nothing, no shops, no school, no future?"

The future of the school in Thorsminde was a central concern. In the 2005-2006 school year it had approximately 35 students from the pre-school to the 6th grade, this was reduced to 22 students from pre-school to 2nd grade by 2008. Even residents who have no children expressed their concerns that the small number of students would both make the town unattractive for newcomers with children, and that the expenses needed to maintain a high quality of teaching for such a small number of students would ultimately lead the school district board to close the school. As one person put it, "if the school closes, more young people will leave, fewer will want to settle here, and the community will slowly die out." Another main concern was the rising number of houses being bought and taken over by people who used them for recreational purposes and did not live permanently in the town. It was in this context that many people identified the role of fishing. As one person explained it, "it's like, if the fishery goes also, then what is left?"

Several people also pointed out that the fisheries were an integral part of the town's attraction to tourists. The town's location on the narrow barrier between the fiord and the North Sea, and the preservation of the areas both to the north and the south of the town, means that the town cannot be further expanded, and that any attempt to attract more tourists needs to target daytrip tourists from other locations. The interviewees who owned businesses directly related to tourism pointed out that the fishing village "feel" needed to be maintained as it was what gave Thorsminde its distinct and authentic feel and thus attracted such daytrip tourists. In addition to the easy access to good beaches and the Stranding Museum, fishing provided another attractive aspect. Major one-day events that are intended to attract tourists are the herring competition held in May and the possibility of going on a cod-fishing trip on a locally owned vessel, as well as the previously mentioned fish auctions at the old harbour.

While these concerns about the fishing industry in Thorsminde were related to the long-term survival of the community, those employed in fishing or fishing-related businesses unequivocally expressed concerns that the number of vessels and active fishermen was rapidly reaching a critical limit for the survival of the local fishing community. The head of the fishermen's organization explained that "we need viability in our fishing. Without that, the fisheries in Thorsminde will die, very quickly." Viability was threatened by the decreasing number of active vessels left in the port as a certain number of vessels is necessary for any of the auxiliary functions to be viable and the port as a whole to be running. The director of the fish auction house reported that the auction's turnover had decreased by 50% since the early 1990s, the majority of this reduction having taken place after 1999, and that the number of employees had been reduced by more than 50% as well. The two fish processing businesses reported similar reductions in turnover and staff numbers.

The port's former shipyard, that also performed vessel maintenance and repairs – was closed and put up for sale in 2006. The only other shop performing similar services had been reduced from six to two employees between 2002 and 2006, and its owner had recently told the fishermen's organization that their earnings, due to the limited number of vessels left, would soon force him out of business as well.

The purchasing association, that is also responsible for the daily management of the port's small fuel station, described their difficulties in making Statoil perform necessary repairs and refuelling. In 2006 they expressed concern that Statoil would soon choose to close the station, but so far (2009) they have succeeded in maintaining it. The purchasing association itself was struggling as well, and was highly dependent on selling fishing equipment to tourists to secure a profit. The daily manager explained that they made no profit from the services they performed for the fishermen – such as repairing fishing nets – as the competition from foreign companies was too tough.

The fishermen so far had tried to make the auxiliary functions more viable by co-running the administration of the fishermen's organization and the fish auction. In addition they had bought the auction in Lemvig, another fishing town, in order to bring in more profit and economize administration expenses.

Also, before 2007 everybody landed almost everything in Thorsminde in support of the local auction. But now they tend to land the fish in different places depending on the prices etc. "People are more for sale, before they were more patriotic". Cod is still landed in Thorsminde; but the prices on mixed fisheries are often too low. "The cod recovery plan has forced people to switch from cod to other species, mixed species. They have better prices for these species in Holland. This has caused the auction's turnover to go down dramatically. But it is not so that that the vessels' economy is doing too badly…"

Although the decreasing number of vessels had been a concern for years, the restructuring of the allocation of fishing quotas in Denmark, effective from 2007, had aggravated the threat to the viability of the fisheries in Thorsminde. The number of vessels in Thorsminde had been in steady decline since the 1980s, but once the new system for allocating fishing quotas was scheduled for implementation in 2007 the sales prices for vessels had more than tripled, the Thorsminde fishermen explained. "For the first time you can actually sell your vessel and make money. Not just break-even – but make a lot of money." In 2008 the change in system and the consequent possibility of making a profit had prompted 6 people to sell their vessels (while one person was still undecided), meaning a decrease by approximately 30% in the number of active vessels in Thorsminde. While some fishermen believed that this development would mean the closure of the port within a couple of years, others were more optimistic. When this study was carried out, the fishermen's organization had formed a cooperative with their sister organization in Hvide Sande and bought five of their vessels in order to ensure that the quotas stayed in the port or in the region and thus contribute to the viability of the fish auction and the ports in general. While those involved in the cooperative believed that fishing would become more viable now, especially those in the auxiliary functions were worried that quotas would be transferred to a minimum number of vessels and thus mean less work for them.

Some of the people who had sold their vessel explained that their decision was driven less by economic incentives than by a growing frustration with the increasing bureaucracy in fishing. One former owner explained that "I probably would have quit in a couple of years anyway. I've been so sick of all the rules, and forms and regulation and control. And now that there was a chance of making a profit I decided to get out sooner rather than later." Some are happy in their new work, but

others, “some of them … well, you can hear [getting out] is a sacrifice they won’t admit. If you speak with them individually, they [say] they don’t like working there [in factories, etc.]. Yet they do not return. And they won’t until the foundation in cod becomes stronger [meaning quota goes up]”.

It is also difficult to find crew members. A number of skippers have sold their vessels, because they thought it was too hard to get good people to go. Some hire Polish and Estonian crew members; and the skippers are often happy with these people. They work hard and they are less demanding than the Danes, but some skippers say that they do not want to speak English all day and hence sold their vessel. Some of them feel that the “culture has been crushed” and that things are very different from earlier. Unfortunately even some younger fishermen have stopped because of these problems. Also, “during the last years, it has been easy to get a job elsewhere, and the fisheries have been going down, so you can’t blame people for leaving”.

All the fishermen who sold their vessels in 2006 had either found employment elsewhere or had retired. Interviews with other former fishermen indicated that none of them had experienced much difficulty in finding alternative employment. Most of them had found employment with either Vestas – a windmill factory in Videbæk, 56 km from Thorsminde – or with Velfac – a window and façade factory in Ringkøbing, 42 km from Thorsminde.

The feelings described by those who had sold their vessels as of January 1, 2007, were similar to those of the remaining fishermen. Many described the disappointment and frustration over the growing bureaucracy in being a fisherman, the impossibility of doing any kind of long-term planning, and the emotional consequences of adhering to the rules. In addition to this was the pride in being a cod fisherman. One person explained that “it’s insane. I’m a cod fisherman, that’s what I am – but this system forces me to fish plaice instead. But not only that – if I catch any cod I’m required to throw it over board. You have no idea how frustrating that is.”

In addition to this pride in being a cod fisher, many described the extra work involved in catching sole. They had to a certain degree been able to fish these species instead of cod, but it was more labour-intensive, and they did not make extra money for that reason. Several fishermen also explained that they did not see the point of landing their catch elsewhere if the port closed in Thorsminde, as that would make their effort less worthwhile. As one fisherman described it, “sure, we could land our catches somewhere else if we had to. But the longer you have to travel, the less time you have with your family – and it’s already bad enough. So there comes a point where one seriously begins to wonder whether it’s worthwhile. And besides, we want to land our catches here, in the community. We want to contribute to the community.”

Others explained that although, for example, they would have liked to buy the necessary equipment to fish turbot, they were reluctant to do so because of the impossibility of knowing what would happen to the quotas in the long run and how extensive the bureaucratic measures would be in the future.

6.2 Review of availability and data collection on socio-economic indicators for Thorsminde

This section presents a review of data from official statistics and public websites. The objective is to review the sources of quantitative data and conclude on their informative value. Data sets have been gathered for use in establishing the Thorsminde community profile and as an illustration of data to be included in the database to be developed for each fishing community.

The review takes off from the dataframe project's listing of seven overarching baseline indicators of industry, community and institutional arrangements, each of them with a number of specific quantitative and qualitative indicators (see table 6.4).

Table 6.4 Baseline indicators of industry, community and institutional arrangements

Overarching indicators	*Specific indicators*
Industry baseline data	
Fisheries	□ species □ seasonal variation □ vessel statistics (age, length, tonnage) □ fishing grounds □ fishing gears □ facilities, e.g. ice, fuel
Onshore sectors	□ number and location of businesses □ interconnections between sectors □ average employment per sector
Safety	□ accident statistics □ safety programmes
Community baseline data	
Population (fisheries and general)	□ number of people □ gender □ age □ employment □ education □ health □ ethnic diversity
Social well-being (fisheries and general)	□ family status □ social networks (what, where, who, how long, why?) □ cost of living (quantitative)
Institutional arrangement baseline data	
Community social institutions and agencies (e.g. business/employment support, education, health)	□ number □ location □ budget □ scale □ scope □ fisheries specific measures/projects □ research investment □ training provision □ staff
Fisheries management institutions	□ number □ location □ budget □ scale □ scope □ regulatory instruments □ staff

6.2.1 Industry baseline data

Fisheries:

The information is mainly based on statistics available from the homepage of the Danish Directorate of Fisheries, The Ministry of Food, Agriculture and Fisheries (www.fd.dk).

Fish landings: The fish landings in the port of Thorsminde are recorded in great detail in the FD database (dynamic statistical tables) from the Directorate of Fisheries.

Landings by species in weight and value are registered on a monthly basis (allowing documentation of the seasonal variations). The origin of the landings can be traced back to ICES squares.

The nationality of the vessels making the landings is registered and for the Danish vessels also their regional belonging. There are 23 districts in Denmark. Vessels from Thorsminde are given the same registration letter (L) as the vessels from the nearby larger fishing port of Thyborøn. For this reason it is not possible to identify the landings from the vessels belonging to Thorsminde separately.

Unfortunately, the landings cannot be related to the fishing gears used.

Vessels:

The registration of vessels is by the homeport. It is therefore possible to document the status and development in the number of vessels and crew members in Thorsminde. The vessel data specify: full time or part time fishing activity, length, tonnage, and engine power.

The age of the fleet and the vessels can only be found at the national level and only in vessel groups by gear type. Such statistics are therefore not available at community (Thorsminde) level.

There were 48 vessels registered for full-time fishing in Thorsminde in 2008. Of these 26 were below 9 metres. In March 2009 the private register "Fiskerforum.dk" had registered 28 vessels with Thorsminde as their homeport. This private register provides basic data on the vessels. The data are supplied on a voluntary basis by the vessel owners including photos etc. The data include information on vessel age, length, power, tonnage and gear use, but no information on vessel economy and production. The data provided by "Fiskerforum.dk" could very well indicate the number of active vessels, as the registration is based on reporting from vessel owners[16].

Data on vessel economic performance is available at a higher level than port; regional average data on all fishing enterprises in 5 regions and at national level by vessel type, length group and gear are available on a yearly basis (Fødevareøkonomisk Institut 2009). These data on vessel economics were previously collected and published by "The Institute of Food and Resource Economics" (FOI), but from 2009 this task was taken over by Statistics Denmark. The statistics on fleet economy can still only be found at the FOI homepage (www.foi.life.ku.dk/Statistik/Fiskeri), but will shortly be available from Statistics Denmark (www.statstikbanken.dk).

Onshore sectors:

It is not possible to find the number and type of onshore businesses at the local (Thorsminde community) level in the official statistics. Fish processing is registered at the county/regional level[17] (Directorate of Fisheries c). At this level different types of processing and trade, including

[16] Fiskerforum is informed about the individual vessel from several sources. In addition to public registers they also get information from vessel owners, crew, other fishery informants and suppliers of equipment for commercial fisheries.

[17] In Denmark 13 counties were turned into 5 regions from 2008 as part of an administrative reform.

smoking, salting, brine or curing; canning, preserving, processing of fish etc.; fish meal manufacturing and fish fillet factories; wholesale companies for fish etc.; and retail trade companies for fish etc., are registered with accounts statistics and the number of employees. In the Thorsminde case, the fisheries statistics therefore cannot provide information on the number and location of the businesses or the employment in the sector, not to speak of the interconnection between the primary and secondary sector. From other on-line sources, such as the port homepage and a yellow page business register, it appears that there are two processing companies in Thorsminde (www.thorsmindehavn.dk; www.gulex.dk).

Aquaculture data is not relevant for the Thorsminde community. However, the statistics from the Ministry of Food, Agriculture and Fisheries provide data on production and employment at the national level. Production figures (volume and value) by species in type of aquaculture plant are available at the county/regional level. The data can be found at the homepage of the Directorate of Fisheries (b).

Information on facilities in the port of Thorsminde such as supply of ice, fuel etc. is available from the Thorsminde port homepage (www.thorsmindehavn.dk).

Safety:

The number of registered work related injuries in fisheries is recorded at the national level and published by the National Board of Industrial Injuries (www.ask.dk). These data are not disaggregated to lower geographical levels.

6.2.2 Community baseline data

Population (fisheries and general):

The main source of population and health data are the dynamic tables provided by Statistics Denmark (www.dst.dk/www.statistikbanken.dk).

Data on the population in Thorsminde is available at community level, which shows a 24% decrease in the population over a 10 year period (1999-2008) (though with a minor shift in the registration areas).

In the official statistics gender and age data are available at the municipality level as the lowest level of disaggregation. The population statistics further provide information on ethnicity at the municipal level by country of origin, KRBEF3.

The official statistics provide employment and education information at the municipal level, employment in 7 industry groups only (RASA1) and education in 81groups (KRUHF-1). For both types the data can be sub-divided into no. of persons of Danish and non-Danish origin.

Health data are available at the municipal level. Health status is indicated by the number of persons, cases and the duration of the support from one of several systems of economic compensation for loss of income due to illness. This information is very specific to the national systems of compensation and cannot be compared across nations (even within Denmark comparisons over years is difficult due to changes in regulations).

Social well-being

Data on family structure is available also at the homepage of Statistics Denmark (Households: FAM55N and families FAM44N), again data can only be disaggregated to municipal level at the publicly available databases.

Also the cost of living can be measured based on data from Statistics Denmark. These data are in general at regional level only.

Information on social networks must in general be gathered locally and by qualitative means. Some social networks tend to get formalised in organisations and can be registered as such, and some are long lasting and might be described in sources as local studies (with other purposes). But generally the importance and local meaning of social networks should be gathered locally and updated regularly in order to grasp the importance of the networks. This applies to the informal networks as well as the more formalised and long-lived.

6.2.3 Institutional arrangement baseline data

Community social institutions and agencies

The local governments (municipalities) in Denmark are supposed to have a high level of digital administration. This means that it is possible to find general descriptions of public institutions as well as local and regional development plans at the municipal homepages.

In the case of Thorsminde the Holstebro municipality homepage informs that in 2008-2009 there are 22 pupils attending the Thorsminde public school (0-3 grade). This means that children in 4th-10th grade and high school frequent schools in other communities. There is no youth education in Thorsminde. There are a range of educational institutions in the region, but all of them at a considerable distance from Thorsminde (e.g. 45 km to the high school in Holstebro) (Ungdommens Uddannelsesvejledning).

As regards business and employment support, a locally rooted process for the formulation of a development plan for the port of Thorsminde has just begun (Thorsminde Port homepage). Other business and employment support institutions operate at regional or national level. Examples are regional initiatives in regard to innovation networks and cluster organisation (www.regionmidt.dk) or support to development projects in the fisheries sector from the European Fisheries Fund (EFF) (www.fd.dk).

Fisheries management institutions

The general fisheries management institutions are national, sometimes with local branches. Information on these institutions, such as the Fisheries Directorate, Fisheries Control etc., can be found via the homepage of the Danish Ministry of Food, Agriculture and Fisheries.

Information on local management institutions with direct relations to the fishery in Thorsminde can generally be found in publicly available on-line data sources. These provide general information about their existence and to some degree their activities. The details in activity and broader function in the locality should be gathered by more “soft” means – interviews, desk research in newspaper articles etc.

The homepage of the Danish Fishermen's Association contains contact information to their local branch – the Thorsminde Fishermen's Association (from 2008 to Thyborøn Fishermen's Association where the Thorsminde fishermen are now organised).

Yellow Page (gulex.dk) lists fishery-related organisations such as the "Thorsminde Quota Pool" (an organisation of fishermen sharing quotas)[18] and the Thorsminde Fishermen's Purchasing Association (Thorsmindefiskernes Indkøbsforening). The last is a company selling equipment and other stuff to the local fishermen. The Yellow Page only contains contact information, no information about function or actual status.

6.3 Comparison of public data availability of socio-economic indicators in UK and Denmark

The dataframe concept has been used as inspiration in a few projects making (a delimited number of) community profiles as part of social impact assessments (Delaney 2007 and 2009). These community profiles build partly on publicly available data, but have interviews and other qualitative data gathering as the main source of information.

The structured collection of already existing data was one of the purposes of a pilot study conducted by the North Sea Women's Network (2007) in three communities in the United Kingdom (Peterhead, Amble and Shetland). Here the availability of data on the socio-economic indicators was also tested. The three pilot studies demonstrated that even within the same country (UK) the possibilities for finding information from official sources and especially public websites differ. The experiences regarding data availability from different sources is summed up in table 6.5, which is supplemented with the data findings from the Thorsminde case. This enables a comparison of data sources and data availability in the UK and Denmark.

The case of Thorsminde revealed that there are Danish data sources for almost all the same indicators as in the UK pilot studies. Based on this, one would expect that studies from other countries with familiar statistical traditions would provide information on the same indicators. How far this tradition reaches is not known. As mentioned in Chapter 3 on (data for) the Annual Report on the fishing fleet economy in the EU, there are significant differences in the data collection methods applied and even in definitions across EU member states. To what extent a structured collection of data can be realized is still to be seen.

The Thorsminde case has demonstrated that scale – the level and units of the analysis – is another aspect to be considered. In the Thorsminde case the town (community) of Thorsminde was chosen as the unit/scale. The town is formed around the Thorsminde port, and as such a natural geographical limitation of the fishing community. However, although data are available, there are differences in the aggregation level. Some data can be found at the local – the fishing community - level, others only at the municipality or county/regional levels and some only at the national level. In the profiling the different levels of data can be reflected; in some areas of information it can be assumed that national data also covers the local community (e.g. Thorsminde), whereas other national data applied at the local level can be directly misleading. But in the construction of a common database for use either as a background for community profiles and/or for comparisons between countries, it will be important to define some common levels of aggregation (scales) for the data. This is a challenge for further development of the dataframe approach.

[18] Following specific internal rules, the organisation administers the members' fish quotas and facilitates the leasing or sale of quotas between the members.

Table 6.5 Comparison of data availability regarding socio-economic indicators in the United Kingdom and Denmark. Socio-economic indicators and types of data sources

	Easily accessible from government statistics		Available online from non-govern-mental sources		Local knowledge		Academic	
	UK	DK	UK	DK	UK	DK	UK	DK
Industry data								
Fleet data	**X**	**C/R**		**C**		**C**		
Business data (sensitive)								
Landings data	**X**	**C**						
Employment	**X**	**R**				**C**		
Onshore data (processing) (sensitive)		**N**	**X**	**C**	**X**	**C**	**X**	**C**
Recreational fishing			**X**		**X**	**C**		
Fleet/landings historical	**X**	**C**	**X**	**C**			**X**	
Community data								
Population by age and gender	**X**	**C/R**						
Employment by age and gender	**X**	**R**						
Education	**X**	**R**			**X**	**C**		
Health	**X**	**R**			**X**			
Neighbourhood statistics, including family composition (general scale)	**X**	**R**				**C**		
Working conditions/job satisfaction								
Cultural diversity						**(C)**		
Social networks	**X**	**R**	**X**		**X**	**C**	**X**	
Historical	**X**		**X**	**R**	**X**	**C**		
Institutional data								
Fisheries management institutions	**X**	**N**	**X**	**N**				
Enforcement bodies	**X**	**N**	**X**	**N**				
Regional business development and support	**X**	**R**	**X**	**N**				
Employment support			**X**					
Local government	**X**	**R**	**X**	**R**	**X**	**C**		
Historical	**X**	**R**	**X**	**C**			**X**	

X - availability in the three UK cases and dataframe case studies – no scale differentiation
C - available at community level
R - available at municipal/regional level
N - available at national level

7. The way forward for socio-economic indicator development

As described in chapter 2 a deterministic model, combining the factors determining the size and technical capabilities of fishing fleets and driving the behaviour of fishermen, to quantify the pressure from fisheries on the ecosystem is not at hand. The Rudd model presented in chapter 2 is an analytic framework that provides an understanding of the key factors driving fisher behaviour, including physical investments, but the "model" does not put weight of importance on the factors or specify causal and other relations in terms that would enable quantification of outcome.

Attempts within WP3 to further develop the Rudd model to include such weights and causalities on the basis of a literature review have grossly failed. It is concluded that it would indeed be possible to identify direction of changes in fishing pressure, but probably not - within a reasonable level of accuracy - to quantify such changes resulting from change in human behaviour, caused by e.g. institutional developments (management regime changes) or developments in the natural capital (changes in the availability of target fish resources).

As reported in chapter 4, the DCR has provided the database for indicators of the economic performance of the EU fishing fleets, which has been developed since 2004 by STECF economists in the annual reports "Economic Performance of Selected European Fishing Fleets". These are indicators of the economic performance of the fleets in the short term (based on the gross cash flow) and the medium term (based on revenue). These indicators have provided information on year-to-year economic developments in a sector characterized by huge changes in the natural resources and prices as well. The indicator values have not been calculated since 2005[19], but the data that will be available from 2008 under the new DCR will provide an improved database for continuing the calculation of these indicators of the economic performance of the EU fishing fleet.

As regards the factors influencing the behaviour of fishers, those factors in the IAD model identified as human and social capital and institutions, the DCR does not provide any data, except for some information on employment. It is also the observation of the NSRAC, that there is a lack of data and analytic framework for assessing social impacts from changes in fisheries, as well as understanding the impacts on fishing practices from social changes.

In the search for indicator systems and data on institutions and social factors the NSRAC Socio-economic Focus Group, in collaboration with the North Sea Women's Network, has undertaken the dataframe pilot project, presented in chapter 5, which has developed and tested a suite of indicators, including the availability of data and methods to compile data that are not readily available from public statistical sources. The dataframe approach was applied on a case study on Thorsminde in Denmark and in the same process the data availability in a non-UK context was tested. Although the data sources and availability differ in some respects between these two countries, the general picture is that it will be possible to gather most of the needed data to make the profiling and data collection in accordance with the dataframe approach.

The WP 3 team has considered the dataframe pilot project a useful approach to developing indicators applicable at RAC level on industry, community, well-being, and social and institutional arrangements. Therefore, collaboration has been initiated with the Socio-Economic Focus Group in the NSRAC on the development of the dataframe approach and the application of the approach in

[19] Some limited indicator data has been provided by the JRC, EU Commission Joint Research Centre for the year 2006.

selected fishing communities around the North Sea. However, to be implemented at an appropriate scale (5-7 communities per NS country) this initiative would require funding far beyond the IMAGE WP 3 and WP 9 budget. Therefore an initiative has been taken to establish a project which could further develop this approach between a numbers of institutions around the North Sea[20]. At present the initiative is searching for funding.

However, the EU-funded research project, UNCOVER[21], as well as the EU-funded study, Profiling of small-scale fishing communities in the Baltic Sea[22], have both applied an approach that is very much inspired by the dataframe. A similar approach is likely to be taken in the study "Regional, social and economic impacts of change in fisheries-dependent communities" that is presently (October 2009) under preparation by the EU Commission. It can thus be concluded that the dataframe approach to developing social indicators applicable at RAC level is already well under way.

[20] The partners of the initiative are: IMARES, MRAG, NORUT, IFM, LEI and the Socio-Economic Focus Group of the North Sea RAC.

[21] UNCOVER, Understanding the mechanisms of stock recovery, Work Package 5, Deliverable 28, Social Impact Assessment and Community Profiling, IFM, 2009.

[22] Study requested by the European Commission, DG MARE, IFM, 2008

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Appendices – for the IMAGE deliverable for WP 3: Sociao-economic indicators and theoir applicaiton

Appendix 1: Economic information in the 2001 DCR – the extended programme

Data needs for basic economic evaluation per fleet segment (EP)

General description	Extended programme Second priority
Landings per species	Seasonal (monthly) Stock (by ICES areas) Market category Regional differentiation (level 3, Appendix I)
Income (turnover)	Subsides (annually) Regional differentiation (level 3, Appendix I)
Production costs: — crew — fuel — repair and maintenance — other operational costs	Further subdivision of operational costs Regional differentiation (level 3, Appendix I) Differentiation of remuneration to crew according to position
Fixed costs	Regional differentiation (level 3, Appendix I)
Financial position	Rents to external institutions Regional differentiation (level 3, Appendix I)
Investment (asset)	By type of investment: hull of vessel, various engines and refrigeration/freezing, storage and lifting equipment
Prices/species	Monthly By market category Regional differentiation (level 3, Appendix I)
Employment	Skill/education Distinction per vessel size, regional differentiation
Fleet	Size categories of fleet segments regional differentiation (level 3, Appendix I)
Effort	Regional differentiation (level 3, Appendix I)

Source: Council of the European Union 2001, Appendix XVIII (section J)

Appendix 2: Economic information in the 2008 DCR

Source: Commission of the European Communities 2008a, Appendix VI

List of economic variables

Variable group	Variable	Specification for the collection of data [19]	Unit	Definition Structural Business Statistics (SBS) Commission Regulation (EC) No 2700/98	Guideline
Income	Gross value of landings	Transversal	EUR	12 11 0 excl. para 4	
	Income from leasing out quota or other fishing rights		EUR	12 11 0 excl. para 4	
	Direct subsidies [1]		EUR	12 11 0 excl. para 4	
	Other income [2]		EUR	12 11 0 excl. para 4	
Personnel costs	Wages and salaries of crew [3]		EUR	13 31 0	
	Imputed value of unpaid labour [4]		EUR	13 32 0	
			EUR		
Energy costs	Energy costs [5]		EUR	20 11 0 (13 11 0)	
Repair and maintenance costs	Repair and maintenance costs [6]		EUR	(13 11 0)	ESA [20] 3.70 e) (1) (2)
Other operational costs	Variable costs [7]		EUR	(13 11 0)	
	Non-variable costs [8]		EUR	(13 11 0)	
	Lease/rental payments for quota or other fishing rights		EUR	(13 11 0)	
Capital costs	Annual depreciation [9]		EUR		ESA 6.02. to 6.05
Capital value	Value of physical capital: depreciated replacement value [10]		EUR		ESA 7.09. to 7.24
	Value of physical capital: depreciated historical value [10]		EUR		ESA 7.09. to 7.24
	Value of quota and other fishing rights [11]		EUR		ESA 7.09. to 7.24
Investments	Investments in physical capital [12]		EUR	15 11 0	ESA 3.102. to 3.111
Financial position	Debt/asset ratio [13]		%		
Employment	Engaged crew [14]		Number	16 11 0; 16 13 0 16 13 1; 16 13 2 16 13 5; 16 14 0 16 15 0	ESA 11.32. to 11.34
	FTE National [15]		Number	16 11 0; 16 13 0 16 13 1; 16 13 2 16 13 5; 16 14 0 16 15 0	ESA 11.32. to 11.34
	FTE harmonised [16]		Number	16 11 0; 16 13 0 16 13 1; 16 13 2 16 13 5; 16 14 0 16 15 0	ESA 11.32. to 11.34

Variable group	Variable	Specification for the collection of data [19]	Unit	Definition Structural Business Statistics (SBS) Commission Regulation (EC) No 2700/98	Guideline
Fleet	Number	Transversal	Number	N/A	N/A
	Mean LOA	Transversal	Metres	N/A	N/A
	Mean vessel's tonnage	Transversal	GT	N/A	N/A
	Mean vessel's power	Transversal	kW	N/A	N/A
	Mean age	Transversal	Years	N/A	N/A
Effort	Days at sea	Transversal	Days	N/A	N/A
	Energy consumption		Litres	N/A	N/A
Number of fishing enterprises/units	Number of fishing enterprises/ units [17]	By size category: 1) owned vessel 2) 2-5 owned vessels 3) > 5 owned vessels	Number	N/A	N/A
Production value per species	Value of landings per species	Transversal	EUR	N/A	N/A
	Average price per species [18]	Transversal	EUR/kg	N/A	N/A

[1] Includes direct payments, e.g. compensation for stopping fishing, refunds of fuel duty or similar lump sum compensation payments. Excludes social benefit payments, indirect subsidies, e.g. reduced duty on inputs such as fuel, investment subsidies.
[2] Includes other income from use of the vessel, e.g. recreational fishing, tourism, oil rig duty, etc. also insurance payments for damage/loss of gear/vessel.
[3] Including social security costs.
[4] For example, the vessel owner's own labour. Chosen methodology should be explained by the Member State in their national programme.
[5] Excluding lubrication oil. Broken down by type if possible (petrol, diesel, biofuel, etc.).
[6] Gross costs of maintenance and repairs to vessel and gear.
[7] Includes all purchased inputs (goods and services) related to fishing effort and/or catch/landings.
[8] Includes purchased inputs not related to effort and/or catch/landings (including leased equipment).
[9] Estimated according to (the proposed PIM methodology in the capital valuation report of study No FISH/2005/03: 'IREPA Onlus Coordinator, 2006. Evaluation of the capital value, investments and capital costs in the fisheries sector Study No FISH/2005/03, 203 p.'). The data and estimation procedures should be explained in the national programme.
[10] Value of the vessel, i.e. the hull, engine, all onboard equipment and the gear. Estimated according to (the proposed PIM methodology in the capital valuation report of study No FISH/2005/03 'IREPA Onlus Coordinator, 2006. Evaluation of the capital value, investments and capital costs in the fisheries sector Study No FISH/2005/03, 203 p.'). The data and estimation procedures should be explained in the national programme.
[11] Where appropriate. Methodology for estimation to be explained in the national programme.
[12] Improvements to existing vessel/gear during the given year.
[13] % debt in relation to total capital value (as defined above).
[14] Number of jobs on board, equal to the average number of persons working for and paid by the vessel. This includes temporary crew as well as rotation crew (See report of Study FISH/2005/14, 'LEI WAGENINGENUR Coordinator, 2006. Calculation of labour including full-time equivalent (FTE) in fisheries Study No FISH/2005/14, 142 p.').
[15] Full-time equivalent (FTE) based on the national reference level for FTE working hours of the crew members on board the vessel (excluding resting time) and the working hours onshore. If the annual working hours per crew member exceed the reference level, the FTE equals 1 per crew member. If not, the FTE equals the ratio between the hours worked and the reference level (The methodology should be in accordance with the Study FISH/2005/14, 'LEI WAGENINGENUR Coordinator, 2006. Calculation of labour including full-time equivalent (FTE) in fisheries Study No FISH/2005/14, 142 p.' and amended by the SGECA 07-01 report (15-19 January 2007, Salerno, 21 p. + annexes) and should be explained in the national programmes.).
[16] Full-time equivalent (FTE) based on a threshold of 2 000 hours per FTE using the same methodology referred to in footnote 15.
[17] Situation at 1st of January as defined in the fleet register. Shared ownership (involving more than one person) should be regarded as one unit.
[18] Prices in euro per kilo live weight.
[19] Economic variables are to be collected on an annual basis at the C3 level (Appendix V) with the exception of those identified as transversal variables and collected at more disaggregated levels (as defined in the Appendix VIII) and periodicity.
[20] ESA refers to European System of Accounts 1995 (Council Regulation (EC) No 2223/96, Regulation (EC) No 1267/2003 of the European Parliament and of the Council, Eurostat ESA 1995 manual).

Appendix 3: Basic segmentation of vessels for capacities, 2001 DCR

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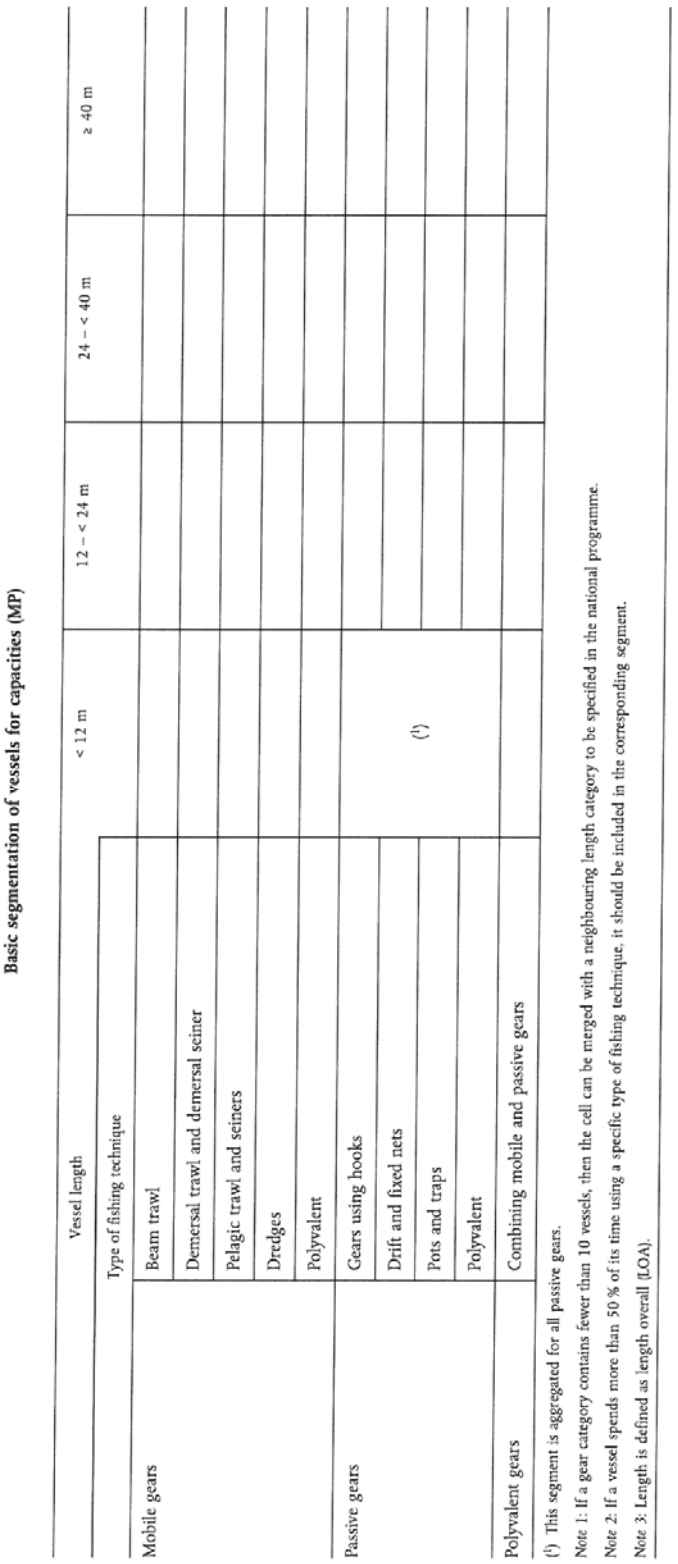

Basic segmentation of vessels for capacities (MP)

Vessel length		< 12 m	12 – < 24 m	24 – < 40 m	≥ 40 m
Type of fishing technique					
Mobile gears	Beam trawl				
	Demersal trawl and demersal seiner				
	Pelagic trawl and seiners				
	Dredges				
	Polyvalent				
Passive gears	Gears using hooks	(1)			
	Drift and fixed nets				
	Pots and traps				
	Polyvalent				
Polyvalent gears	Combining mobile and passive gears				

(1) This segment is aggregated for all passive gears.

Note 1: If a gear category contains fewer than 10 vessels, then the cell can be merged with a neighbouring length category to be specified in the national programme.

Note 2: If a vessel spends more than 50 % of its time using a specific type of fishing technique, it should be included in the corresponding segment.

Note 3: Length is defined as length overall (LOA).

Source: Council of the European Union 2001, Appendix IV (section C)

Appendix 4: Fleet segmentation by region, 2008 DCR

Fleet segmentation by region

		Length classes (LOA) (1)					
		0-< 10 m 0-< 6 m	10-< 12 m 6-< 12 m	12-< 18 m	18-< 24 m	24-< 40 m	40 m or larger
Active Vessels							
Using 'Active' gears	Beam trawlers						
	Demersal trawlers and/or demersal seiners						
	Pelagic trawlers						
	Purse seiners						
	Dredgers						
	Vessel using other active gears						
	Vessels using Polyvalent 'active' gears only						
Using 'Passive' gears	Vessels using hooks	(2)	(2)				
	Drift and/or fixed netters						
	Vessels using Pots and/or traps						
	Vessels using other Passive gears						
	Vessels using Polyvalent 'passive' gears only						
Using Polyvalent gears	Vessels using active and passive gears						
Inactive vessels							

(1) For vessels less than 12 metres in the Mediterranean Sea and the Black sea, the length categories are 0-< 6, 6-< 12 metres. For all other regions, the length categories are defined as 0-< 10, 10-< 12 metres.
(2) Vessels less than 12 metres using passive gears in the Mediterranean Sea and the Black Sea may be disaggregated by gear type.

Source: Commission of the European Communities 2008a, Appendix III